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EPTEMBER 14, 1942
OLUME 31, No. 19

AMERICAN DYESTUFF REPORTER

SEP 21 1942
DETROIT

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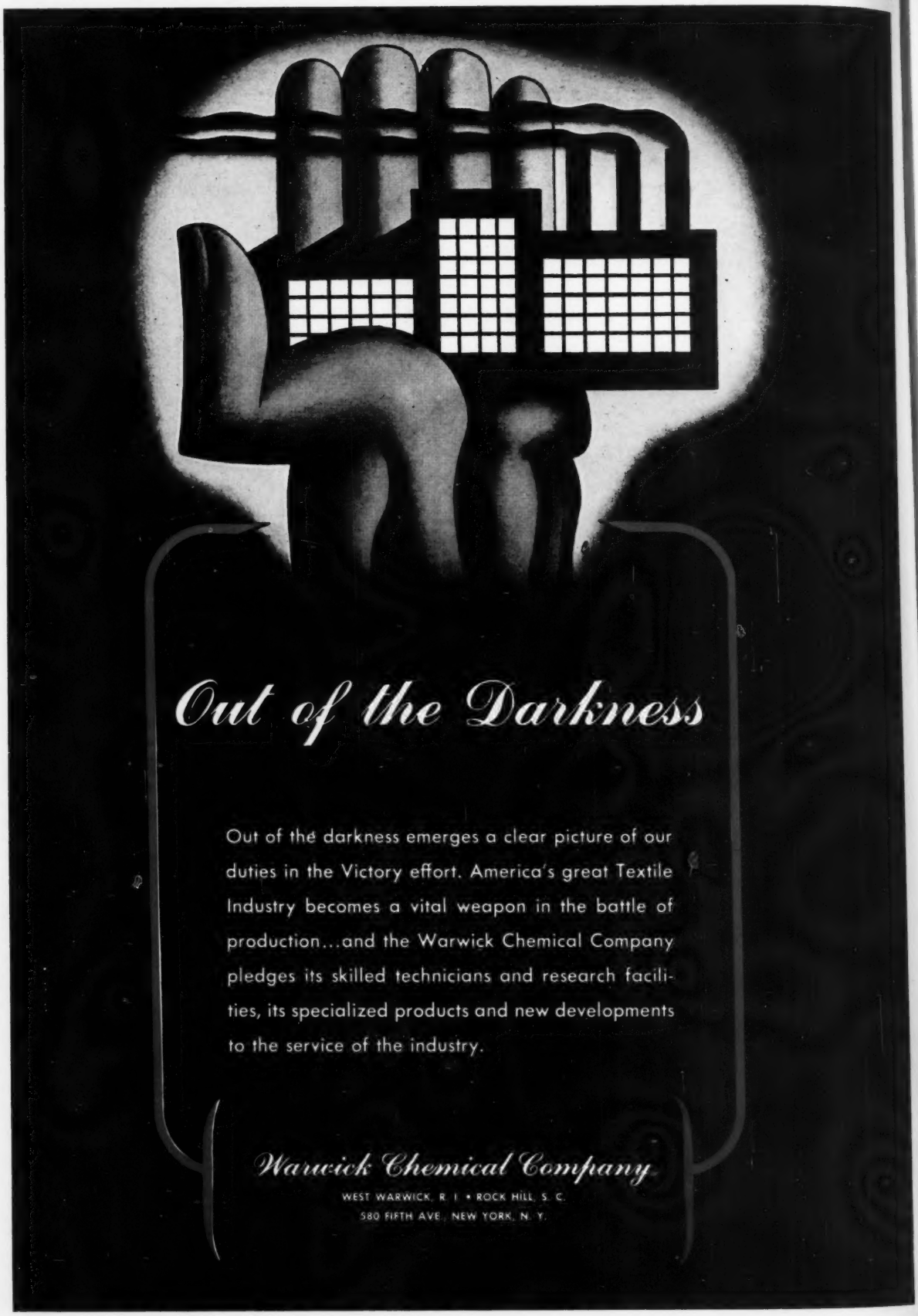
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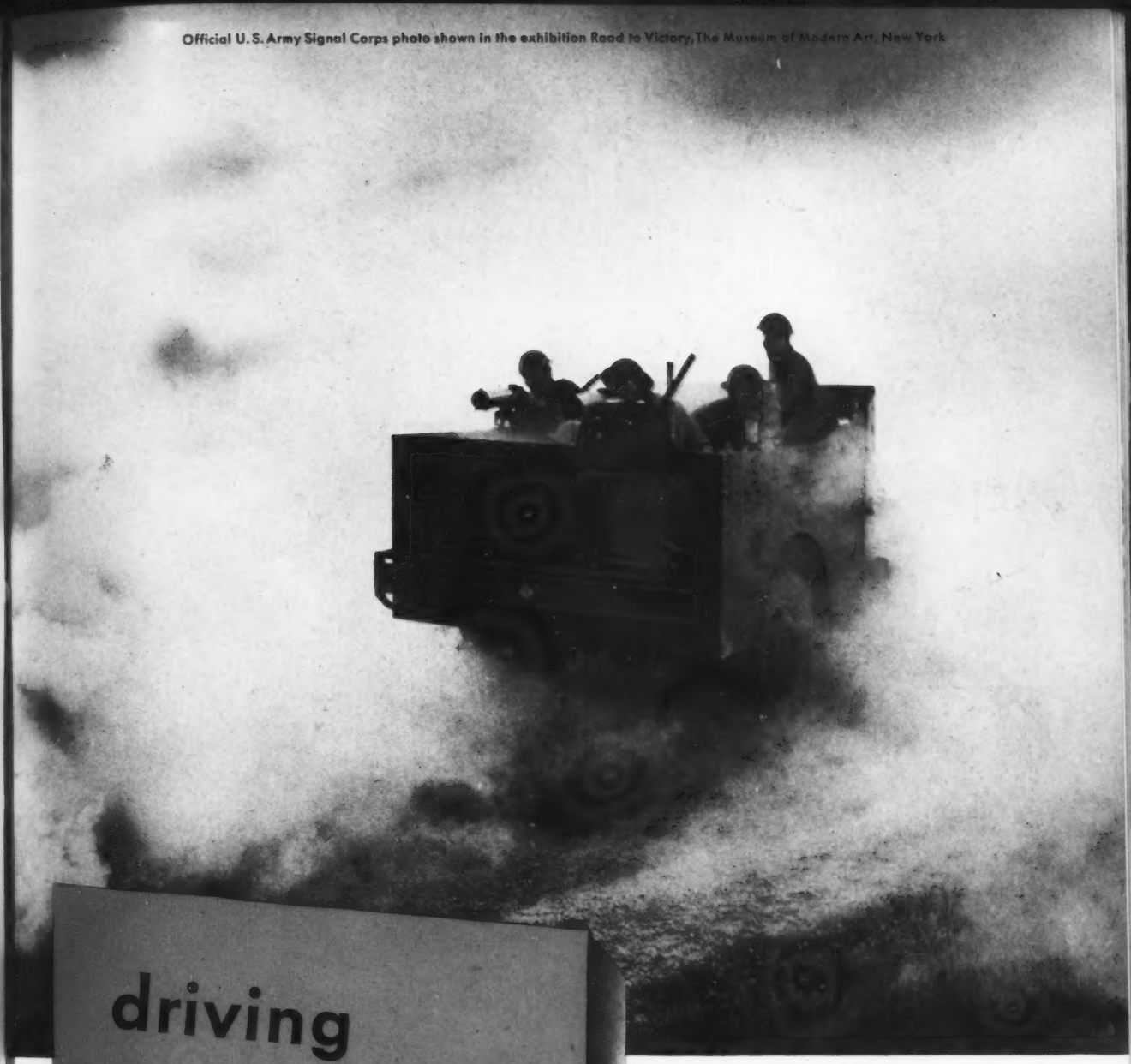

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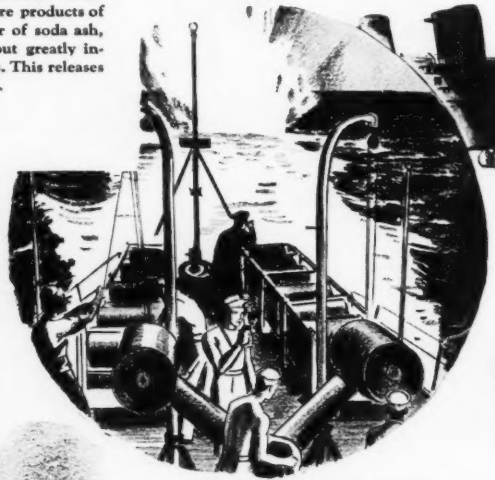

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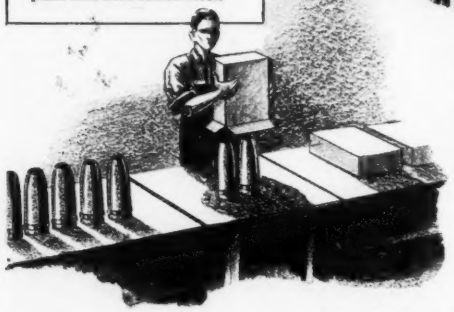

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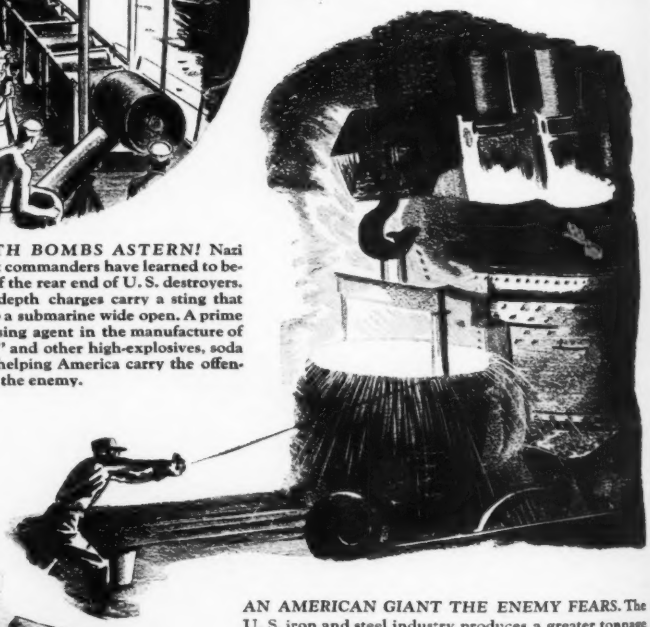

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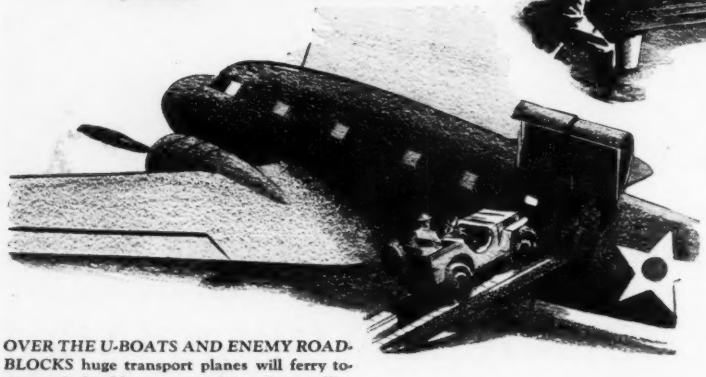

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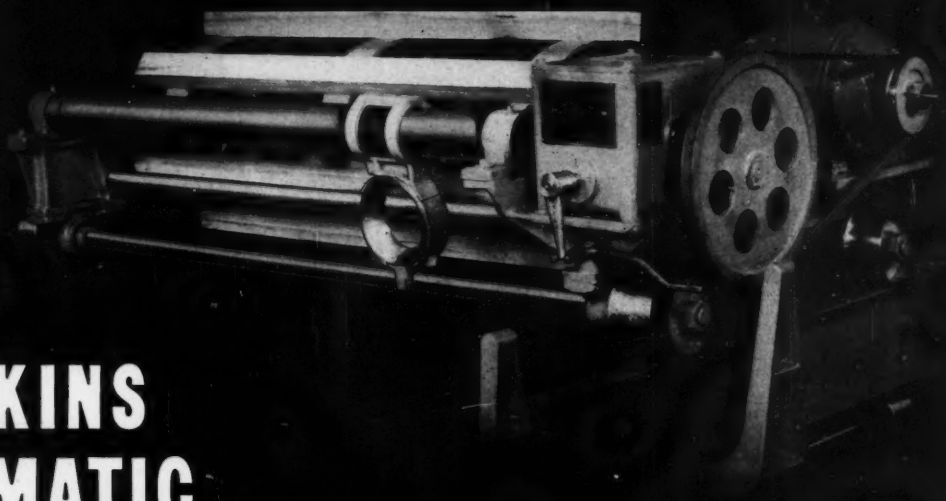

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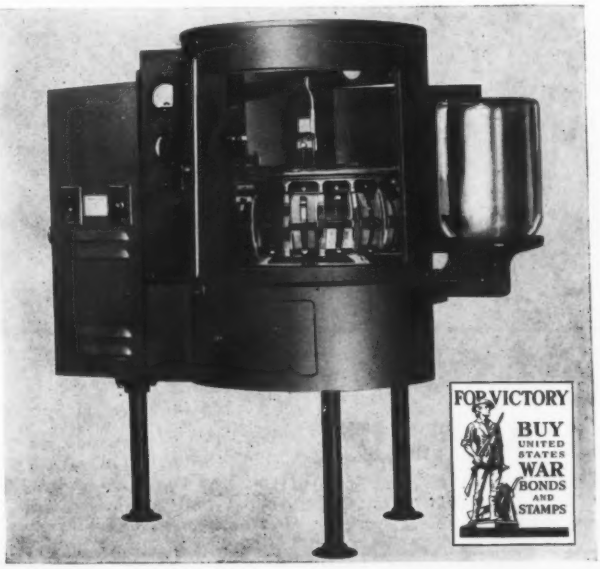

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SEPTEMBER 14, 1942

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AMERICAN
DYESTUFF REPORTER

VOLUME 31 SEPTEMBER 14, 1942 NUMBER 19

A Comparative Study of Four Methods for the Quantitative DETERMINATION OF WOOL in Mixed Fabrics

LILLIAN E. WEIDENHAMMER

Junior Chemist, Textiles and Clothing Division, Bureau of Home Economics, U. S. Dept. of Agriculture

INTRODUCTION

THE increasing use of fiber mixtures, which will be even greater now because of the emergency situation, will undoubtedly emphasize the importance of the Wool Labeling Act and increase the already great interest in methods for the quantitative estimation of wool.

The American Society for Testing Materials recognizes the sulfuric acid and the aluminum chloride methods as tentative standards[1]. In both of these methods the cellulosic fiber is removed chemically, leaving the wool.

In the caustic boil method, widely used in industry because it is quick and convenient, the wool is dissolved and cotton or rayon remains. The cellulosic material dissolves to some extent also in the caustic solution which necessitates the use of a correction factor in calculating the percentage of cotton or rayon. A. S. T. M. is now including this method also in the D-13 manual[1].

In all chemical methods one component of the mixture is destroyed leaving the other as residue. It is possible to separate wool from either cotton or viscose rayon by a flotation method which makes use of the difference in the specific gravity of the fibers. Both components are recovered. A. S. T. M. has given some attention to this method also[1].

Since there is a great interest in the analysis of wool in mixed fabrics at this time, it seemed worthwhile to undertake a study in which the same operator would analyze several mixed fabrics by all four of these methods. This was done in the Bureau of Home Economics on two wool-rayon and two wool-cotton fabrics that had been manufactured for experimental purposes, and on two commercial blanket fabrics containing mixtures of wool, cotton, and rayon. In addition, rayon and cotton fabrics were added to an all-wool fabric and these mixtures were analyzed also.

LITERATURE REVIEW

Villavecchia and Cappelli[2], Heerman[3], Schulze[4], Lloyd and Priestley[5], Krais and Markert[6], and Matthews[7] have discussed methods of determining the cotton in wool-cotton mixtures by dissolving the wool with boiling alkali, and methods of determining the wool by dissolving the cotton in concentrated sulfuric acid.

Two per cent caustic soda was usually used in boiling out the wool component, but several of the authors recommended 5- or even 10- per cent caustic potash. The caustic boil method has generally been considered unsatisfactory because of the correction necessitated by the solution of some cellulosic material in the boiling alkali, and because wool content had to be determined indirectly. It is widely used, however, because it is an easy method and saves time.

The above authors discuss the numerous attempts made to perfect a convenient method whereby wool could be determined directly. A great deal of attention was given to the sulfuric acid method with a view to increasing its accuracy and making it more convenient and less time-consuming. The procedure generally described was to treat the sample, from which all nonfibrous material has been removed, with 80-per cent sulfuric acid for from 3 to 6 hours, shaking the mixture vigorously at frequent intervals. Under these conditions the cotton completely dissolved while the wool remained unchanged except for a gain in weight of approximately 1.5 per cent.

Ryberg[8] developed the sulfuric acid method adopted by the American Association of Textile Chemists and Colorists, and with which the A. S. T. M. method[1] conforms in substance. He found that if the sample were pretreated by boiling in dilute sulfuric acid, the cotton dissolved completely within 15 minutes upon treatment with 70-per cent sulfuric acid. Wool subjected to these successive acid treatments did not show an appreciable change in weight. Presumably any increase in weight occurring as a result of treatment with the concentrated acid was counterbalanced by a similar decrease in weight resulting from the pretreatment with dilute acid.

The results obtained by five laboratories cooperating

under Ryberg's direction in the development of the sulfuric acid method showed that the method was entirely satisfactory for new wool but not for reworked wool[8]. The study was made on wool-cotton mixtures, but preliminary observations indicated that silk, regenerated cellulose rayon, and acetate rayon all completely dissolve when treated by this procedure.

Mease and Jessup[9] in a study of the sulfuric acid method and of the aluminum chloride-carbonization method used in some industrial laboratories, but hitherto unpublished, found that samples of 100-per cent cleaned wool changed in weight upon treatment with sulfuric acid to a greater extent than did similar samples treated by the different steps of the aluminum chloride method. Therefore they devoted their attention to the latter method.

Analyses of prepared wool-cotton mixtures gave percentages of wool content in good agreement with the percentages known to be present. Mease and Jessup concluded that, with the modifications suggested as a result of their work, the aluminum chloride method is convenient and applicable for the accurate determination of wool in mixtures with cotton and regenerated cellulose, but not with cellulose acetate.

Recently Committee D-13 of the American Society for Testing Materials and a subcommittee of the American Association of Textile Chemists and Colorists sponsored jointly an interlaboratory study of the sulfuric acid and aluminum chloride methods for the analysis of wool in mixed fabrics[10]. On the basis of that work and the opinions expressed in the October 1940 meeting, section 5 of A. S. T. M. Sub-committee A-3 voted to recommend that the aluminum chloride method be deleted from the D-13 manual and the sulfuric acid method be accepted as the tentative standard for the analysis of wool.

Accurate physical methods that are not too tedious are highly desirable since in such methods both components of the fiber mixture are recovered. Larose[11] developed a flotation method for the separation of wool and lanital which can be readily modified for the separation of wool from cotton or viscose rayon. Separation is effected by means of the difference in the specific gravity of the fibers. An inert liquid is used, such as a mixture of carbon tetrachloride and toluene, the specific gravity of which is between that of the fibers to be separated. A liquid of specific gravity 1.400 will separate wool from cotton or viscose rayon.

Larose's method has been appended to the D-13 manual of A. S. T. M. as a proposed method for the quantitative analysis of textiles composed of wool and lanital[1]. Its applicability to the separation of wool from cotton and viscose rayon is noted.

MATERIALS AND METHODS

The fabrics designated A and B were made specially for Ryberg's work on the sulfuric acid method from blends of cotton and wool combed together[8]. Fabric A contained approximately 80 per cent wool; fabric B, approximately 20 per cent wool.

Fabrics C and D were manufactured under the direction of the Bureau of Home Economics from known new wool and spun viscose rayon. Yarns were spun from carefully weighed wool and rayon and woven into these fabrics. Fabric C contained two-thirds wool; D, one-third wool.

All four of these fabrics were used also in the interlaboratory study sponsored by A. S. T. M. and A. A. T. C. C. and discussed in the literature review[10]. Fabrics E and F were blankets bought on the retail market. Fabric E was not labeled for fiber content. Fabric F was labeled as containing 50 per cent staple rayon, 25 per cent wool, and 25 per cent cotton. E was yellow, and F green. Both had been treated with a moth repellant.

All-wool, all-cotton, and all-viscose rayon fabrics, also manufactured for experimental purposes, were used in making up the known mixtures.

All fabrics were degreased before sampling. Ether-alcohol extraction was used except with the two blanket materials for which carbon tetrachloride was used.

Sampling was according to a randomized block design. From each of three blocks of fabric, four samples were cut and assigned at random to the four methods.

The sulfuric acid method as described in the 1941 Year Book of the American Association of Textile Chemists and Colorists[12] was followed as closely as possible. The concentration of the 70-per cent sulfuric acid was checked with a hydrometer and also by titration.

The procedure for the aluminum chloride method described in A. S. T. M. Standards on Textile Materials[1] was followed except in the separation of the carbonized material from the wool. This was done by first rubbing the charred sample between the hands over a 100-mesh copper screen and then washing the residue thoroughly in the sieve, rather than by screening entirely in the dry state.

The procedure and calculations used for the caustic boil method were also as given in the A. S. T. M. D-13 manual[1].

For the flotation method the work of Larose[11] and the method proposed by Committee D-13 of A. S. T. M.[1] were followed in substance. Details of technique were worked out in preliminary experiments. It was found that for efficient separation the sample must be very uniformly reduced to a powdery condition, and three successive flotations should be made.

The technique finally adopted was to first cut up the sample as directed in the A. S. T. M. method and in Larose's paper and then to force the material through a 40-mesh copper sieve. Material that would not pass through the screen was cut further with the scissors until all of it would pass through. Better results were obtained this way than with the mill usually used for preparing finely divided samples. The cutting action of the mill does not reduce the fibers uniformly, and even when the sample is run through three times long fibers and unbroken clumps remain that prevent complete separation of the components in the flotation liquid. Also, much material is lost, and it

is possible that more of one type of fiber than the other will be lost. It is known that in the manufacture of mixed fabric, wool tends to cling to the machinery more than cotton or rayon. It seemed best, therefore, not to use the mill for this purpose.

Samples of approximately 0.3 grams were used. Since both components are recovered it is not necessary to weigh the sample before separation. The finely ground material was placed in an 8-inch test tube which was then filled about three-fourths full with the flotation liquid, a mixture of toluene and carbon tetrachloride of specific gravity 1.400 ± 0.005. The specific gravity was determined with a hydrometer. The tightly stoppered test tube was shaken well and allowed to stand until the liquid between the separated layers was clear, usually 2 to 3 hours. The top layer was then transferred into another test tube with some of the liquid. More liquid was added to each tube and the shaking and standing repeated. Three successive flotations were carried out without filtration between each one. The final separation was made by carefully transferring top and bottom layers onto separate fluted filters. The air-dried material could be transferred without any difficulty into weighing bottles. Both fractions were heated to constant weight, and the wool content calculated from these weights.

Samples of 1.5 to 2.0 grams were tried also in order to reduce the percentage error and also so that they would be comparable in size to the samples used in chemical methods. The separations in this case were carried out in ordinary 250 ml. beakers. The results obtained were not appreciably different from those with the smaller samples. Therefore, the smaller samples were used for the comparative study since less time and material were consumed.

The data of Table 1 were analyzed by the statistical method of analysis of variance[13]. Also, the number of test samples that should be used for each method was calculated[1].

DISCUSSION OF RESULTS

The data in Table 1 indicate that the sulfuric acid method can be expected to give higher results than do the other methods. This difference is statistically significant. It is difficult to explain why the reverse is true in the case of fabric F. Since this reversal could be due to some factor inherent in the fabric, the history of which was not known, it seemed advisable to exclude the data for this fabric from all of the statistical calculations.

The results obtained by the flotation, caustic boil, and aluminum chloride methods are not significantly different generally. The only instance of a significant difference is between the caustic boil and aluminum chloride methods when the data for fabric E, the yellow blanket material, are included. The difference between these two methods is not significant when only the results for the experimental fabrics are considered.

No explanation could be found for the extreme variation of the D-3 sample analyzed by the flotation method. This deviation was too large to be ignored. Therefore the data for all three samples of fabric D, flotation method, were excluded from all statistical calculations. This necessitated two separate analyses of variance, one including all fabrics but omitting the flotation method, the other including all methods but omitting fabric D. The sums at the bottom of Table 1 were used in the two analyses of variance and show the variation between methods when the results for all the fabrics under consideration are totaled. The block sums at the right of the table show the variation between samples for each fabric when the results for all the methods under consideration are totaled.

TABLE 1

Percentages of wool found in six different fabrics analyzed by caustic boil, aluminum chloride, sulfuric acid, and flotation methods.

Fabric	*Caustic boil*	*$AlCl_3$*	*H_2SO_4*	*Flotation*	*Block Sum*
A—1	18.4	78.5	79.0	79.3	315.2
2	78.3	78.1	79.6	79.3	315.3
3	78.5	78.1	79.8	79.1	315.5
Mean	78.4	78.2	79.5	79.2	
B—1	20.5	21.2	21.5	21.4	84.6
2	20.3	21.3	21.3	20.3	83.2
3	20.1	21.2	21.1	19.8	82.2
Mean	20.3	21.2	21.3	20.5	
C—1	63.1	63.0	63.8	63.0	252.9
2	63.2	63.0	63.5	62.7	252.4
3	62.6	62.7	64.3	62.2	251.8
Mean	63.0	62.9	63.9	62.6	
D—1	30.1	31.0	31.7	29.8	122.6
2	30.3	31.7	32.2	30.1	124.3
3	30.4	31.6	31.7	(21.3)	115.0
Mean	30.3	31.4	31.9	30.0	
E—1	12.0	13.1	14.3	13.4	52.8
2	12.7	14.5	14.0	11.2	52.4
3	12.7	11.0	13.9	12.4	50.0
Mean	12.5	12.9	14.1	12.3	
F—1	....	32.2	28.1	33.2	....
2	....	33.2	28.0	31.9	....
3	....	31.7	28.0	31.0	....
Mean	....	32.4	28.0	32.3	
Sum 1*	613.2	620.0	631.7	....	
Sum 2*	522.4	525.7	536.1	524.1	....

*The two sets of sums for the methods were used in the analysis of variance. The data for fabric F are not included in the sums. In sum one are totaled results for fabrics except fabric F but omitting flotation method; in sum two, results for all methods but omitting fabric D and F.

Both uniformity of the fabric and reliability of the methods are indicated by the small differences in the percentages of wool content found for replicate samples. The analyses of variance showed that the differences between blocks were not significant.

The results of the determinations on the known mixtures should give some indication of the reliability and the accuracy of these methods. Judging from these results, given in Table 2, the flotation method seems to be very unreliable. The other three methods show a high degree of precision.

The accuracy of the caustic boil method is, obviously, dependent upon an accurate correction factor. For the cotton used in the known mixtures a correction allowing for 3 per cent loss of cotton is apparently twice as large as it should be. Five per cent for the mixture containing rayon seems to be about right.

Both the sulfuric acid and aluminum chloride methods appear to be accurate enough for most purposes. Results obtained by the aluminum chloride method seem to be too low by approximately the same amount that sulfuric acid method results are too high.

TABLE 2

Percentages of wool present and found in wool-cotton and wool-rayon known mixtures analyzed by caustic, aluminum chloride, sulfuric acid, and flotation methods.

	Wool—cotton mixtures				*Wool—rayon mixtures*			
	1	2	3	*Mean*	1	2	3	*Mean*
Caustic boil method								
Wool present, percent	48.7	49.4	49.5		49.1	49.7	49.6	
Wool found, percent	47.9	48.7	48.9		48.9	49.7	49.6	
Difference, percent	—0.8	—0.7	—0.6	—0.7	—0.2	0.0	0.0	—0.1
Percentage loss of cotton or rayon	1.5	1.6	1.7	1.6	4.6	4.9	4.9	4.8
$AlCl_3$ method								
Wool present, percent	47.6	47.3	47.3		50.5	49.4	50.1	
Wool found, percent	47.2	46.6	46.6		49.7	48.8	49.5	
Difference, percent	—0.4	—0.7	—0.7	—0.6	—0.8	—0.6	—0.6	—0.7
H_2SO_4 method								
Wool present, percent	47.6	48.3	48.8		49.7	49.7	50.3	
Wool found, percent	48.3	48.5	49.4		50.3	50.3	50.8	
Difference, percent	+0.7	+0.2	+0.6	+0.5	+0.6	+0.6	+0.5	+0.6
Flotation method								
Wool present, percent	50.6	50.2	49.8		50.1	50.8	51.4	
Wool found, percent	52.5	48.5	46.9		50.3	51.7	54.3	
Difference, percent	+1.9	—1.7	—2.9	—0.9	+0.2	+0.9	+2.9	+1.3

The wool-cotton fabrics, designated as A and B, had been analyzed in the interlaboratory study sponsored by A. S. T. M. and A. A. T. C. C.[10] by the same operator who carried out the present work. The time interval was about a year. A comparison of the results is shown in Table 3. All results were significantly higher the second time. Furthermore, the earlier values are in good agreement with the mean values for all the laboratories cooperating in the interlaboratory check.

The only difference in technique was in the method of degreasing. In the inter-laboratory study carbon tetrachloride was used, and the fabrics were analyzed immediately after the degreasing. In this latter work, fabric was used that had been degreased some time previously by the *ether-alcohol extraction method**. This offers a possible explanation for the difference in results.

*H. C. Haller in his "Investigation of Alcohol Extracts from Fine Wool." Am. Dyestuff Reptr. *30*, 221-2 (1941), states that wool extracted with alcohol shows very definite evidences of damage due to the action of the alcohol. This fact could account for the higher results obtained.

TABLE 3

Percentage of wool found in two wool-cotton fabrics by same operator in this and in former interlaboratory study using $AlCl_3$ and H_2SO_4 methods

	Method $AlCl_3$	H_2SO_4
Fabric A		
In interlaboratory study	76.7	78.4
In this study	78.2	79.5
Difference	+1.5	+1.1
Mean for all laboratories in interlaboratory study	77.0	78.1
Fabric B		
In interlaboratory study	20.5	21.0
In this study	21.2	21.3
Difference	+0.7	+0.3
Mean for all laboratories in interlaboratory study	20.8	21.1

In calculating the number of tests to be taken for a desired precision, the fabrics were grouped according to wool content as in the report of the results of the interlaboratory check[10]. The choice of a 1 per cent error for high wool content, and 2 per cent for low suggested in that report as the random sampling error that should probably be allowed seems to be borne out by this work. A probability of 95 per cent is generally considered satisfactory for most test purposes.

On this basis, the results of the calculations of number of tests shown in Table 4 indicate that two samples are probably sufficient for all four methods when the wool content is high, and also for all except the flotation

TABLE 4

Coefficients of variation and number of tests for caustic boil, aluminum chloride, sulfuric acid, and flotation methods for the analysis of wool in mixed fabrics

Coefficients of variation

Fabric	*Caustic boil*	*$AlCl_3$*	*H_2SO_4*	*Flotation*
A	0.128	0.295	0.524	0.146
B	.985	.273	.939	3.99
C	.511	.275	.633	0.645
D	.505	1.205	.906	....
E	3.24	13.688	1.48	8.933

Number of tests

High wool content				*Low wool content*			
Allowable random sampling error, E, Percent	*Number of tests where P equals* 0.90	0.95	0.99	*Allowable random sampling error, E, Percent*	*Number of tests where P equals* 0.90	0.95	0.99
	Caustic boil method				*Caustic boil method*		
0.5	3	4	7	0.5	11	15	26
1	1	1	2	1	3	4	7
2	1	1	1	2	1	1	2
	$AlCl_3$ method				*$AlCl_3$ method*		
0.5	1	2	3	0.5	16	23	39
1	1	1	1	1	4	6	10
2	1	1	1	2	1	2	3
	H_2SO_4 method				*H_2SO_4 method*		
0.5	5	7	11	0.5	10	14	24
1	1	2	3	1	3	4	6
2	1	1	1	2	1	1	2
	Flotation method				*Flotation method*		
0.5	5	7	11	0.5	100+	200+	
1	2	2	3	1	43	62	100+
2	1	1	1	2	11	16	27

method when wool content is low. In the case of the flotation method with low wool content, the number of tests, 16, is too large to be practical. This, of course, is merely another aspect of the unreliability of the method.

From this work it would seem that the caustic boil is not only a useful method because of the rapidity and ease with which it can be carried out, but it is also reliable and can be very accurate if the correction factor can be accurately determined. Apparently further work needs to be done in order to determine whether the factors for cotton and rayon are constant for all fabrics, that is, whether the loss of cotton or rayon is dependent upon the type and quality of the fiber itself or entirely upon the conditions of test such as concentration of solution and length of time of boiling. The flotation method is not reliable but might be useful in some instances, especially wherever it is desirable or necessary to use small samples, or to recover both fractions. The aluminum chloride would be an excellent method if it were not for the inconvenient and time-consuming carbonization process. The sulfuric acid method probably offers the best possibilities for further improvements to increase accuracy. The only disadvantage in this method is the use of large quantities of 70-per cent sulfuric acid. This, of course, is not serious when acid of this strength is readily obtainable, but in the present emergency the question of the availability of sulfuric acid may present practical difficulties.

SUMMARY

In this work the caustic boil, aluminum chloride, sulfuric acid, and flotation methods for the determination of wool in mixed fabrics were studied. The same operator analyzed four fabrics manufactured for experimental purposes and two commercial blanket fabrics by these four methods. Known mixtures were prepared and the wool contents of these were determined also. The results were analyzed statistically and calculations were made for the number of test samples necessary for a given precision.

The results indicate that the sulfuric acid method generally gives higher results than do the other methods, which do not differ greatly among themselves. All of the methods except the flotation have a high degree of precision. The caustic boil method is very accurate if the correction factor can be accurately determined. The aluminum chloride method tends to give results that are too low by about the same amount as the sulfuric acid results are too high.

For routine analysis two samples are probably sufficient for any of these four methods.

There are advantages and disadvantages to all four methods. The caustic boil is quick and convenient but requires a correction factor to allow for the loss of some cellulosic material when the wool fraction is dissolved in caustic soda. The results of this study indicate that further work should be done to determine the extent to which various cotton and rayon materials are dissolved under the conditions of this test. The flotation method is somewhat unreliable but requires only a small sample and both components can be recovered. The carbonization process in the aluminum chloride method is tedious and time-consuming and deleterious to operator and equipment. The sulfuric acid method requires fairly large quantities of 70-per cent sulfuric acid that may not be available at this time. Both aluminum chloride and sulfuric acid methods are precise and reasonably accurate.

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Nickel, Monel and Inconel in Textile

BLEACHING OPERATIONS*

BLEACHING is a major step in most textile finishing operations. The bleach liquors generally used are highly reactive substances, either strongly corrosive to metallic construction materials, or susceptible to decomposition unless manipulated carefully.

This bulletin discusses the results of several investigations of the effects of corrosion and the decomposition of bleach liquors in contact with processing equipment fabricated of nickel, Monel[1] and Inconel.[1] In the discussions, hypochlorite and peroxide solutions are dealt with separately.

BLEACHING WITH HYPOCHLORITES ("CHLORINE" BLEACHING)

The behavior of nickel, Monel and Inconel in hypochlorite bleaching solutions is determined principally by:

(1) Concentration of "available chlorine."
(2) Time of contact of the metal with the solution.
(3) Condition of the metal surface.
(4) Presence of corrosion inhibitors.

"Available Chlorine" Concentration

Solutions containing appreciable concentrations of "available chlorine" are highly corrosive to metals, and considerable caution is advisable in the use of metal equipment for hypochlorite bleaching. Most textile bleaching operations are carried out in cycles, in which bleaching is followed by rinsing and souring in the same machine. In such usage, metal equipment contacts the corrosive liquors for relatively short periods with the result that the corrosion problem is considerably less severe.

Tests on Monel in agitated sodium hypochlorite solutions at room temperature have shown negligible corrosion in exposures of short duration to solutions with concentrations of "available chlorine" below 3 gpl.[2] Short-time tests at that concentration have shown average rates of penetration by corrosion of about 0.001 ipy.[3] for contact with the bleaching solutions 8 hours daily over a one-year period. Lower or higher rates have been found to apply for shorter or longer periods of daily contact with the bleaching solutions.

When the "available chlorine" concentration is increased to 4 gpl., the corrosiveness of the solution, as indicated by corrosion rates, is quadrupled and, at 7 gpl., rates are over ten times as high as at 3 gpl.

Similar results have been obtained with pure nickel, and with nickel-copper alloys of lower nickel content than Monel. The nickel-copper alloys are generally inferior to Monel in "available chlorine" concentrations under 3 gpl. Nickel behaves similarly to Monel in weak hypochlorite solutions, but is generally inferior in concentrations where "available chlorine" is over 3 gpl. It should not be selected in preference to Monel for hypochlorite bleaching equipment.

On the basis of the foregoing and other data, Monel is considered to be satisfactory for use in handling sodium hypochlorite solutions containing not more than 3 gpl. "available chlorine" (0.3 per cent), or calcium hypochlorite solutions of not greater than 2.5 gpl. "available chlorine" (0.25 per cent). This limitation is not a serious one since solutions containing greater concentrations of "available chlorine" are not in common use for textile bleaching in equipment likely to be constructed of Monel. Experience has demonstrated the soundness of these practices.

Tests with Inconel have indicated that it is more resistant than either nickel or Monel to corrosion by hypochlorites, especially where the concentration of "available chlorine" is over 3 gpl. However, since these stronger solutions tend to impair the properties of textile fibers and are used rarely for textile bleaching, this advantage probably is of little practical importance.

Nickel, Monel and Inconel are not recommended for tanks or pipe lines to handle concentrated stock bleaching solutions. "Hastelloy" alloy[4] C, a high-nickel alloy containing, in addition, principally molybdenum, chromium, and iron, is about the best metallic material for use in contact with the strong stock solutions, and may be used successfully for valves, piping, and fittings. In strong solutions at temperatures much above atmospheric, there may be some attack on "Hastelloy" alloy C, and corrosion tests under the conditions of use are recommended on samples of this alloy. This alloy is available as casting of all sizes and in some wrought forms, such as sheets and plates.

Earthenware, glass-lined or cement-lined tanks should be used for preparing and holding stock hypochlorite bleach solutions. In preparing the bleaching bath for use with goods, the strong stock bleach should be diluted well before being added to the machine or dye kettle, and then it should be added to as large a volume of water as good bleaching practice permits.

Time of Contact

Experience with nickel alloys in hypochlorite solutions

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* Reprinted from Bulletin T-22, Development and Research Division, International Nickel Co., Inc.
[1] Reg. U. S. Pat. Off.
[2] Grams per liter.
[3] Inch penetration per year.
[4] A product of Haynes Stellite Company, Kokomo, Ind.

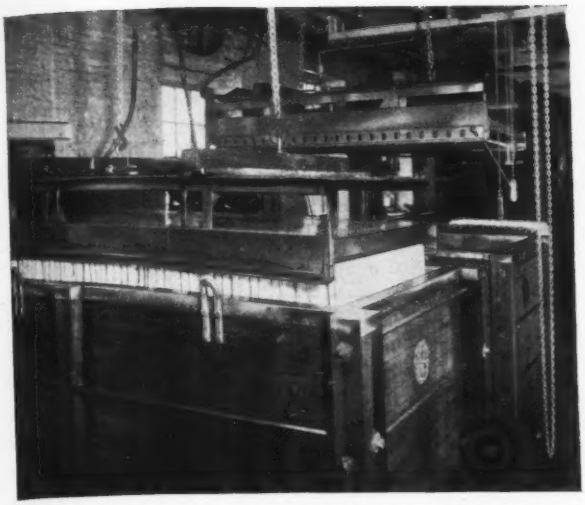

Fig. 1—Two of four Monel-lined "Hussong" skein dyeing machines in regular use at one textile mill for sodium hypochlorite bleaching.

used for sterilizing and bleaching has shown that, in making tests over different periods of time in which the "available chlorine" content is maintained at a constant value, corrosion increases appreciably as the test period is prolonged. In some tests in 0.5 per cent sodium hypochlorite solution (5 gpl. "available chlorine"), negligible corrosion of nickel was noted during the first 3 to 8 hours' exposure, of Monel during the first 3 to 6 hours, and of Inconel during the first 7 hours. This is of practical importance since most hypochlorite treatments require less than 3 hours. It is also common practice to use the same equipment for preliminary scouring, final rinsing, souring and soaping, as well as for the bleaching operation. Under such circumstances, contact of the metal with the chlorine bleach bath alone is usually for less than 3 hours at any one time so that the severe corrosion which might occur in prolonged contact is avoided.

Nickel, Monel and Inconel are not recommended for use in *continuous* contact with hypochlorite bleaching solutions, even where the concentration of "available chlorine" is below the prescribed limit of 3 gpl. Practically, this amounts to saying that nickel, Monel and Inconel equipment are satisfactory where the bleaching, rinsing and souring operations are carried out in cyclic order in the same machine, but that these materials should not be used as containers for hypochlorite solutions in processes where goods are moved from one machine to another for each of the operations, and where the bleaching solutions are held to strength by periodic additions of strong hypochlorite solution. Such processes are used generally in bleaching lace and rayon, where the goods are wound on reels that are moved automatically through the bleach baths, sours and final rinses in cyclic order. While Monel should not be used for holding the bleaching solution required for these processes, it is suitable for reels and other material-carrying devices which come in contact with the bleach bath for a relatively short period, and which pass in turn through the souring and rinsing solutions as well. Where inhibitors are used with the hypochlorite solutions, as is discussed later, corrosion is reduced so that Monel frequently may be used successfully outside the limitations which have been described here.

Surface Finish

Resistance to corrosion by hypochlorite solutions is influenced greatly by the smoothness or degree of polish of the metal surface. Signs of corrosion may become evident at cut edges or in roughly finished areas before attack is visible elsewhere on the metal surface. This has been demonstrated by comparative tests on roughly ground and highly polished Monel specimens in which, as indicated in Table I, a decided advantage has been shown for the highly polished specimens.

TABLE I
Corrosion of Monel in Sodium Hypochlorite Solution Containing 5 gpl. of "Available Chlorine"

Surface Finish	Corrosion Rate ipy.
Highly polished	0.004
Roughly ground	0.013

It is highly desirable, therefore, to maintain as smooth a surface as possible on metal bleaching equipment. It is also essential in making comparative corrosion tests on different metals and alloys to use specimens having the same degree of surface polish, since, otherwise, the less highly polished specimens will be at a disadvantage, and the results will not be truly comparable. For the same reason, the finish of test specimens should approximate that likely to be used on the plant equipment.

Effect of Inhibitors

Inhibitors, such as sodium silicate (water-glass) or trisodium phosphate, have marked effect in reducing cor-

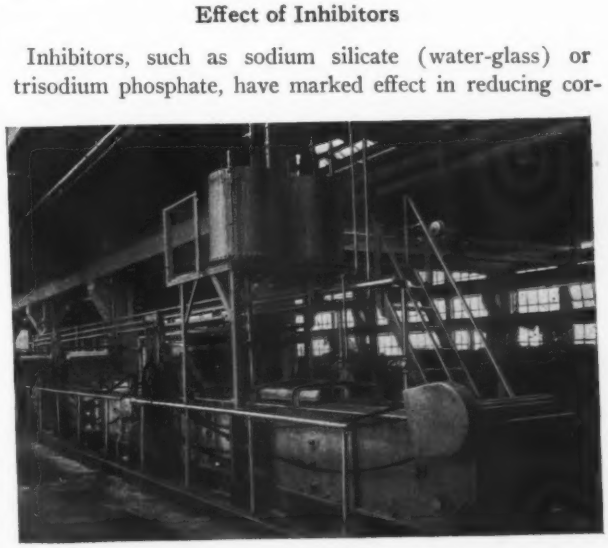

Fig. 2—A continuous bleaching, scouring and dyeing machine at the plant of a prominent rug manufacturer. All parts requiring corrosion-resistant materials are made of Monel.

rosion of nickel, Monel and Inconel in hypochlorite solutions. The inhibitive effect holds for solutions containing as much as 6.5 gpl. "available chlorine." Data illustrating the inhibitive properties of these salts in sodium hypochlorite solutions are given in Table II.

TABLE II
Effect of Inhibitors on Corrosion by Sodium Hypochlorite Solutions

Solution Composition gpl.			Corrosion Rate ipy.		
"Available Chlorine"	Sodium Silicate	Trisodium Phosphate	Nickel	Monel	Inconel
6.5	..	..	0.052	0.113	0.012
6.5	0.5	..	0.010	0.018	0.002
6.5	..	0.5	0.020	0.008	0.002
6.5	2.0	..	0.001	0.002	0.001
6.5	..	2.0	0.009	0.003	0.001
3.3	..	..	0.030	0.039	0.005
3.3	0.5	..	0.004	0.001	0.001
3.3	..	0.5	0.006	0.004	0.001
0.1	..	..	0.004	0.004	0.002
0.1	0.5	..	0.0005	0.0003	0.0007
0.1	..	0.5	0.0006	0.001	0.0007

It is important to note that, in those solutions having an inhibitor along with the hypochlorite, corrosion is uniform and not confined to local areas. Specimens in contact with solutions containing 6.5 gpl. "available chlorine" have shown some slight susceptibility to local corrosion, even with an inhibitor present, though the tendency toward such attack has been reduced appreciably by the inhibitor. With an inhibitor present in concentrations of 3.3 gpl. "available chlorine," or less, the corrosion is uniform, with local attack entirely absent.

In laboratory tests, as little as 0.025 cc. of sodium silicate solution (1.4 sp. gr.) per liter of bleaching solution has been found effective in reducing corrosion. In concentrations greater than 0.2 cc. of sodium silicate solution per liter, a gelatinous precipitate forms. This precipitate does not form in solutions containing less than 0.2 cc. per liter of the sodium silicate solution. The action of the silicate in reducing corrosion is due to its formation of a very thin adherent film over the metal surface. This film does not survive exposure to acid scouring baths. Therefore, sodium silicate should be included in each new bleaching bath as it is made up and, preferably, prior to the addition of the goods to be bleached. For this purpose, from 1 to 2 fluid ounces of sodium silicate solution (1.4 sp. gr.) to 100 gallons of bleaching solution should be adequate.

It is noteworthy that the presence of sodium silicate, or of trisodium phosphate, does not retard the effectiveness of bleaching in hypochlorite solutions.

TABLE IV
Calcium Hypochlorite Solutions

Degrees Twadell	Specific Gravity	Available Chlorine gpl.	Available Chlorine oz. per gal	Chloride of Lime oz. per gal.*
⅛	1.0006	0.35	0.0465	0.16
¼	1.0011	0.70	0.0931	0.32
½	1.0025	1.40	0.1862	0.64
¾	1.0037	2.05	0.2727	0.94
1	1.0050	2.71	0.3604	1.24
1¼	1.0062	3.38	0.3495	1.55
2	1.010	5.38	0.7421	2.57
5	1.025	14.47	1.9245	6.64
10	1.050	29.41	3.9115	13.50
20	1.100	61.17	8.1356	28.08

* Quantity of bleaching powder added to each gallon of water in making up the solution.

NOTE: The horizontal lines mark the limiting concentration of available chlorine for successful use of Monel equipment.

Practical Experiences in "Chlorine" Bleaching

It is common practice to use Monel dyeing equipment for "chlorine" bleaching processes as, for example, where dyeing is done on a "bleach bottom." In one cotton mill having several types of Monel dyeing machines, bleaching with sodium hypochlorite solutions of about 2 gpl. "available chlorine" is carried on in each machine. The bleaching operations are followed by rinsing, souring and, usually, dyeing in the same machine. The Monel machines resist the corrosive conditions quite satisfactorily. In other textile plants, Monel is being used with complete success for "chlorine" bleaching in all the common types of dyeing equipment.

(Continued on page 460)

TABLE III
Sodium Hypochlorite Solutions

Degrees Twadell	Sodium Hypochlorite Made With Caustic Soda			Sodium Hypochlorite Made With Caustic Soda and Soda Ash*			Sodium Hypochlorite Made With Soda Ash		
	Specific Gravity	Available gpl.	Chlorine oz. per gal.	Specific Gravity	Available gpl.	Chlorine oz. per gal.	Specific Gravity	Available gpl.	Chlorine oz. per gal.
¼	1.001	0.60	0.0798	1.001	0.40	0.0532	1.001	0.37	0.0492
½	1.002	1.20	0.1596	1.002	0.80	0.1064	1.002	0.74	0.0984
¾	1.003	1.90	0.2527	1.003	1.20	0.1596	1.003	1.10	0.1463
1	1.005	2.50	0.3325	1.005	1.80	0.2394	1.005	1.50	0.1994
1¼	1.006	3.10	0.4123	1.006	2.15	0.2859	1.006	1.90	0.2527
1½	1.007	3.70	0.4921	1.007	2.35	0.3025	1.007	2.20	0.2926
1¾	1.008	4.30	0.5719	1.008	2.80	0.3724	1.008	2.70	0.3591
2	1.010	4.90	0.6517	1.010	3.40	0.4522	1.010	3.00	0.3990
5	1.025	14.47	1.9251	1.025	8.35	1.1105	1.025	7.0	0.9310
10	1.050	28.5	3.79	1.050	16.7	2.221	1.050	14.0	1.862
20	1.100	57.0	7.581	1.100	33.4	4.442	1.100	28.0	3.724
30	1.150	84.0	11.172	1.150	50.0	6.650	1.150	42.0	5.586

* These values apply to a mixture of 20 parts soda ash to 8 parts caustic soda, which is a typical ratio for a solution of the mixed type.

NOTE: The horizontal lines mark the limiting concentrations of available chlorine for the successful use of Monel equipment.

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American Association of Textile Chemists and Colorists

SEPTEMBER 14, 1942

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Members should notify the **Secretary** immediately of all address changes.

UNEMPLOYMENT REGISTER

Members of this association, who are without employment, should forward to the secretary a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the American Dyestuff Reporter any vacancies which may occur in their business.—H. C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

NOTICE TO EMPLOYERS

Personal Histories and Employment Records of the following applicants are on file at the office of the American Dyestuff Reporter. Prospective employers may examine them without obligation.

Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive.

NOTE: PERSONS WHO HAVE OBTAINED EMPLOYMENT SHOULD NOTIFY THE SECRETARY OR THE AMERICAN DYESTUFF REPORTER AT ONCE.

A-1

Education—Graduate textile chemistry and dyeing course, Lowell Textile Institute, 1932. Special course in colloid chemistry at M.I.T.

Experience—Library work in spare time while attending school; five years as assistant chemist with knitting mill, duties consisting of testing and grading silk, testing of oils, soaps, dyes, finishes and other chemicals, making up specifications for various lines of hosiery and checking finished product, keeping a check on production costs, control of waste and irregulars, checking competing products and carrying on research to improve product and reduce costs. Woman; age 30; references.

A-2

Education—B.T.C., Lowell Textile Institute, 1933.

Experience—Textile chemist, cotton and rayon thread; agricultural chemist, protein, fat and mineral analysis; special Federal inspector on textiles, New York City; U. S. inspector, war department; chemist-spotter, dry cleaning experience. Age 32; married.

A-3

Education—B.S. in chemistry, Lehigh University.

Experience—Experimental engineer and analytical chemist, 8 mos.; assistant superintendent of silk corporation, assisted in planning and directing production, in charge of laboratory, technical work, personnel, purchasing, etc., 2 years; inspector of ordnance material, to the present. Seeks position as chemical engineer or chemist.

Age 25; single; references.

A-B-9

Education—Textile School Graduate; Alexander Hamilton Institute Business Course.

Experience—Mature, executive type of textile chemist and colorist with over twenty years' broad general experience in factory, laboratory, purchasing and all around business procedure. Good correspondent. Excellent personality. Wholesome appearance. Fine speaker. Literary and artistic ability. Real color sense. Possesses fund of factual information about material things in a wide range of industries. Capable of meeting the highest type of clientele and planning and directing the efforts of all types of personnel. Desires supervisory, contact, promotional or sales work. Willing to prove ability and versatility.

Age 44; American born; New England Yankee ancestry; married.

A-B-17

Education—Graduate of Franklin Union and Lowell Textile Institute, 1942.

Experience—1936 until present as assistant dyer in hosiery dye works. Experienced on full fashioned and anklet hosiery, handling wool, cotton, silk, rayon and nylon and combinations; has charge of weighing dyestuffs, testing and shade matching; experience with hosiery dyeing machines of all sizes. Seeks position as assistant dyer or laboratory technician.

Age 24; married; references.

A-B-18

Education—Graduate Philadelphia Textile School, 1940.

Experience—Has experience as assistant chemist and trouble shooter in silk dyeing and finishing plant; as manager of laundry store; and as printer and colorist in screen printing plant. Seeks position in laboratory and research, dyeing, printing or finishing.

Age 21; single; references.

A-B-C-F-3

Experience—Broad experience since 1906 as overseer of finishing, general researcher, trouble shooter, overseer of dyeing, general superintendent, mill manager. Experienced in woolen, worsted, cottons, unions and mixtures. Recently specialized in men's wear cottons. Seeks position as overseer of finishing or dyeing, assistant superintendent, superintendent or manager.

Age 53, married; references.

A-C-D-1

Education—Chemistry, Temple College, Philadelphia, evenings. Dyeing and textile chemistry, Philadelphia Textile School.

Experience—Employed about 18 years in textile mill, becoming chemist; 5 years as superintendent of finishing on silk and rayon ribbons; 10 years as salesman of chemicals and textile specialties in eastern Pennsylvania and parts of New Jersey; has some knowledge of the processing of all textiles. Seeks position as salesman with well known company.

Age 48; married.

B-10

Education—2 years chemistry, 2 years textile chemistry and dyeing, Lowell Textile Institute, evenings.

Experience—4½ years dyeing and bleaching hosiery, specializing in children's and infants' hose; 3 years assistant dyer, dyeing and bleaching cotton, mercerized and unmercerized, wool, wool-cotton, wool-rayon and wool-silk hose. Seeks position as second hand, assistant dyer or laboratory assistant in hosiery mill.

Age 27; single; references.

B-D-1

Education—High school graduate; textile chemistry, Textile Evening High School, New York City; accounting; typist.

Experience—from 1935 to present employed as colorist with screen printing plant in New York City. Experienced with all types of fibers and all types of dyes. Shade matching. Versed in accounting, typing, modern office procedure and sales promotion. Able assistant to busy executive. Age 46; single; references.

C-1

Experience—Experienced as assistant finisher, finisher and superintendent of finishing since 1923. Experience on automobile cloth, boucle overcoatings, high grade men's wear worsted, low grade woolens, medium grade plaid-back overcoatings, fleece finish overcoatings, Bolivias, kerseys, medium-grade men's piece dye suitings, uniform cloth, flannels, ladies' dress goods and coatings, government serge and elastique fabrics, marine wool, flannel shirtings.

Age 37; married, 3 children; references.

REPORT OF THE NOMINATING COMMITTEE

THE Councilors Representing Sections, in their capacity as Nominating Committee, have directed the Secretary to report the following nominations for the election of 1942:

For President—Thomas R. Smith.

For Vice-Presidents—Roland E. Derby and Charles A. Seibert.

Under the Constitution, additional nominations, each signed by at least twenty-five Senior members, filed with the Secretary not later than October eighth, will be given equal standing on the ballot.

Respectfully submitted,

HAROLD C. CHAPIN, *Secretary.*

CALENDAR OF COMING EVENTS

Meeting, New York Section, October 2, 1942.

Meeting, Philadelphia Section, October 9, 1942.

Council and Research Committee Meetings, Philadelphia, Pa., October 10, 1942.

MEMBERSHIP

APPLICATION BLANKS

for individual

and corporate

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The Effect of Temperature in SCOURING WOOL

GEORGE C. LeCOMPTE* and JOSEPH W. CREELY**

I. INTRODUCTION

IN THE process of determining the yield or shrinkage of a sample of wool, the wool is freed from impurities by scouring it in an alkaline bath containing soap and soda ash. Even when preliminary dry cleaning almost entirely removes the dirt it still appears necessary to complete the cleansing with a scouring procedure. When an alkaline bath is resorted to, there is the possibility of actually dissolving the wool. Of the degree to which wool may be dissolved by alkaline scouring very little is known; however, it does appear definite that it would take place to a greater extent at high temperatures than at low.

One method of estimating damage to wool caused by oxidation consists in boiling the oxidized wool in a sodium carbonate solution and determining the amount of wool dissolved. This loss may amount to from 10 to 15 per cent of the original amount of wool. The investigations on the solubility of wool in alkaline scouring solutions as here reported were conducted in the wool research laboratory of the Agricultural Marketing Administration, mainly to obtain a definite experimental basis for determining the best temperature to use in any standard method of scouring wool samples to estimate shrinkage. In addition to ascertaining the degree of solubility of wool in alkaline scouring solutions of different temperatures, and the optimum scouring temperature to use in a standard method of determining yield and shrinkage of grease wool samples, investigations were made of the extent of damage to samples scoured at different temperatures.

II. EXPERIMENTAL DETAILS

In conducting these experiments, fine Idaho grease wool was blended by passing it through a Wilson type picker a total of eight times. From this blended wool replicate 200 gram samples were drawn. Samples were scoured in solutions consisting of 0.5% textile soda, ($Na_2CO_3.NaHCO_3$) and 0.1% olive oil soap, at each of the following temperatures: 80°F., 100°F., 120°F., 140°F., 160°F. and 180°F. Samples were given three baths in three separate bowls of the foregoing solutions, each sample being squeezed as it was lifted from one bowl to another. Contact of the samples with the scouring solution was approximately six minutes. After the three scouring baths, the samples were passed through one rinse water and then allowed to air dry, after which they were weighed and the moisture content of each determined from a 50.00 gram subsample. These samples were further analyzed for ash and grease content and for alcohol extract.†

The yields of clean wool from the various samples were calculated to a 12 per cent moisture content basis, both with and without correcting for the impurities present.

At present there does not seem to be any rapid quantitative method for determining the extent to which wool is damaged by alkaline solutions. It was thought that possibly damage caused by alkaline scouring solutions could be estimated by means of the relative number of free amino and carboxyl groups per gram of dry wool ("free" as contrasted with their possible combination into peptide,—CONH—linkages). Presumably, in whatever other ways wool might react during the time when the alkaline damage is occurring, there should also be some hydrolysis of the peptide linkages to give free amino and free carboxyl groups while breaking the polypeptide chain. (It is of course possible by severe alkaline or acid hydrolysis to completely break the polypeptide chain of which wool is supposed to consist. As a result, there would be formed the constituent amino acids, most of which would contain at least one "free" amino and at least one "free" carboxyl group).

The problem of determining the relative number of free amino and carboxyl groups per gram of wool is a difficult one, but it would appear that it might be solved by the adsorption methods used by Steinhardt, Fugitt, and Harris[1]. The methods used in our experiments would not pretend to measure with absolute accuracy the number of free amino and carboxyl groups per gram of wool. However, it would appear that relatively speaking, the results obtained by these methods should parallel the extent of damage to the samples.

The scoured samples that had been extracted with petroleum ether and with alcohol were dried and placed in a known volume of standard HCl solution. They were allowed to stand for 24 hours with occasional stirrings so that the adsorption system could arrive at equilibrium. Aliquots were then removed and the unadsorbed HCl was determined by titration with standard NaOH solution, using methyl red as an indicator. Admitting that undamaged wool has considerable power to adsorb HCl, it is

* Associate Wool Technologist, Agricultural Marketing Administration, United States Department of Agriculture.
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† Methods of analysis were the same as those of the A.S.T.M. with the exception that petroleum ether was used as the grease solvent.

still true that the amount of HCl adsorbed by damaged wool will be influenced to some extent by an increased number of free amino groups per gram of wool.

Due to the difficulty of completely rinsing the samples, some alkali remained adsorbed on the wool and operated to give an apparent increase in the amount of hydrochloric acid bound per gram of wool. From the conditions in this experiment, it would seem that the amount of hydrochloric acid adsorbed per gram of wool is to some extent a measure of the free amino group plus, (because of the adsorbed alkali), an unknown fraction of the free carboxyl groups per gram of wool.

III. RESULTS

In Table 1 we find that the total percentage of residual impurities varied from a maximum of 3.97% in the case of samples scoured at 80 degrees F. to a minimum of 2.32% with samples scoured at 120 degrees F. In the case of the samples scoured at 80 degrees F. and at 100 degrees F. it appears that by correcting to a standard content of total residue impurities of 2.5% a noticeable decrease in yield results. With samples scoured at the other temperatures (120 degrees—180 degrees), this correction has only a very minor effect. Apparently, only at the temperatures of 80 degrees F. and 100 degrees F. does an excessively large amount of residual impurities remain in the wool. The question then arises as to whether there is any evidence of an excessive dissolving action upon the wool when subjected to scouring at the higher temperatures. From the results obtained. it does appear that the higher scouring temperatures result in appreciably decreasing yields.

TABLE 1
Percentage Yield of Samples Scoured at Different Temperatures

Temperature of Scouring	*Sample*	*Total Residual Impurities %*	*% Yield—Corrected to 12.00% Moisture Content*	
			Uncorrected for Residual Impurities	*Corrected to 2.50% Total Content of Residual Impurities*
Degrees				
80	A	...	43.30	42.65
80	B	3.97	43.38	42.73
80	Ave.	...	43.34	42.69
100	A	...	42.56	42.08
100	B	3.61	42.15	41.67
100	C	...	42.98	42.49
100	D	...	42.77	42.28
100	Ave.	...	42.62	42.13
120	A	...	42.26	42.34
120	B	...	42.89	42.97
120	C	2.32	41.65	41.72
120	D	...	42.47	42.55
120	Ave.	...	42.32	42.40
140	A	...	42.00	41.98
140	B	...	42.83	42,81
140	C	2.55	42.31	42.29
140	D	...	41.80	41.78
140	Ave.	...	42.24	42.22
160	A	...	42.47	42.42
160	B	...	41.96	41.91
160	C	2.62	42.27	42.22
160	D	...	41.96	41.91
160	Ave.	...	42.17	42.12
180	A	...	42.33	42.21
180	B	2.78	41.68	41.56
180	C	...	42.34	42.22
180	Ave.	...	42.12	42.00

In Figure 1, the straight line of least squares for all determinations has a regression coefficient or slope of —0.0044% yield per degree F. This indicates that samples scoured at 80 degrees F. will average 0.44% higher yield of clean wool than samples scoured at 180 degrees F. Thus, if samples of grease wool that weigh 250 grams produce an average of 100.00 grams of clean wool, or a yield of 40.00% when scoured at 180 degrees F., the same samples would produce an average of 101.10 grams with a yield of 40.44% when scoured at 80 degrees F. To properly remove the impurities from the wool, however, it appears necessary to use a scouring temperature of at least 120 degrees F. If this is accepted as standard scouring temperature, it appears that the average yields of samples so scoured would be about 0.18% lower than if the sample had been scoured at a temperature of 80 degrees F. For all practical purposes, this decrease in yield of 0.18% is negligible. It is felt advisable to point out again that these results are based on scouring with textile soda, Na_2CO_3 . $NaHCO_3$.

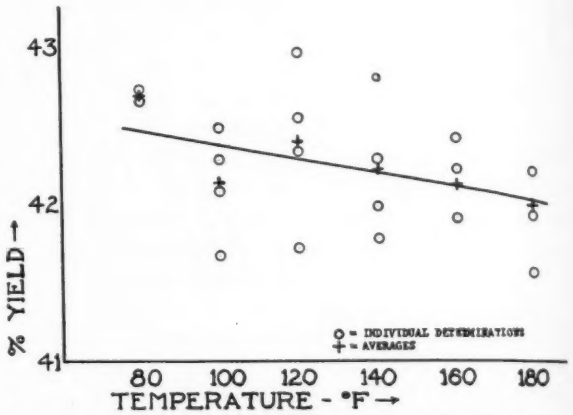

FIG. 1 - % YIELD vs. TEMPERATURE of SCOURING

It appears rather strange that the average yield of samples scoured at 100 degrees F. when corrected to a standard content of impurities should be lower than that of all samples except those scoured at 160 and 180 degrees F. A statistical study of the individual results indicated that the low yield in the samples scoured at 100 degrees F. was not significant for a probability of 0.9 and was probably due to a sampling error which occurred when these samples were originally made up.

In Table 2, we find that the grease content of the sam-

TABLE 2

Residual Impurities, Air Dry Moisture Content, Color, and Openness of Scoured Samples

Temperature of Scouring	Determination	% Ash	% Grease Content	% Alcohol Extract	% Total Residual Impurities	Color	Openness
80	A	1.19	1.43	1.40	...		
80	B	1.15	1.41	1.35	...		
80	Ave.	1.17	1.42	1.38	3.97	Fair	Good
100	A	1.03	1.09	1.83	...		
100	B	0.95	1.16	1.15	...		
100	Ave	0.99	1.13	1.49	3.61	Fair	Good
120	A	0.80	0.29	1.23	...		
120	B	0.84	0.36	1.11	...		
120	Ave.	0.82	0.33	1.17	2.32	Good	Best
140	A	1.05	0.20	1.26	...		
140	B	0.91	0.17	1.49	...		
140	Ave.	0.98	0.19	1.38	2.55	Best	Fair
160	A	1.04	0.18	1.46	...		
160	B	0.94	0.16	1.45	...		
160	Ave.	0.99	0.17	1.46	2.62	Poor	Poor
180	A	1.03	0.16	1.58	...		
180	B	1.07	0.18	1.54	...		
180	Ave.	1.05	0.17	1.56	2.78	Very Poor	Poor

TABLE 3

Adsorption of HCl by Wool Samples Scoured at Different Temperatures

Temperature of Scouring	Sample	Millimoles HCl adsorbed per Gram of Dry Wool
80	A	0.878
80	B	0.884
80	Ave.	0.881
100	A	0.908
100	B	0.908
100	Ave.	0.908
120	A	0.923
120	B	0.936
120	Ave.	0.930
140	A	0.966
140	B	0.947
140	Ave.	0.957
160	A	0.986
160	B	0.973
160	Ave.	0.980
180	A	0.998
180	B	0.976
180	Ave.	0.987

ples scoured at higher temperatures are progressively lower. From this aspect, the higher temperatures appear to be advantageous. On the other hand, if we consider the samples from the standpoint of their color and openness we find that the optimum temperature seems to be somewhere around 120-140 degrees F. It is interesting to note that contents of ash and alcohol extract exhibit a minimum at 120 degrees F. This was confirmed by duplicate determinations. In explanation, it can be said that contents of ash and alcohol extract are greatly influenced by the thoroughness of the rinsing procedure followed, which in turn depends a great deal upon the openness or fluffiness of samples. Considering the table as a whole, it would appear that the optimum scouring temperature would be somewhat higher than 120 degrees F. but not as high as 140 degrees F. In view of the fact that samples scoured under 120 degrees F. contain large amounts of residual impurities a standard scouring temperature of 125 degrees F. would appear to be safest.

When the adsorption tests in Table 3 were set up it was expected that samples scoured at the higher temperatures would exhibit higher adsorption for the hydrochloric acid. The basis for expecting higher adsorptions of hydrochloric acid, of course, was that there would be a greater number of "free" amino groups per gram of dry wool.

In the hydrochloric acid adsorptions, higher values for the samples scoured at higher temperatures were found. Based on the original assumptions it would appear that these tests have demonstrated by chemical methods that greater damage occurs in scouring at higher temperatures. Further work is necessary, however, to demonstrate that this method of testing for damage is completely reliable.

IV. CONCLUSIONS

Although the following conclusions are indicated by the results of the tests, it should be noted that in most cases they do not correspond to a statistical probability of 0.95.

1. Samples scoured at higher temperatures exhibited smaller yields of clean wool than those scoured at lower temperatures.

2. Samples scoured at higher temperatures had lower grease content.

3. Samples scoured at 120 degrees F. exhibited lower alcohol extracts and ash contents than the samples scoured at other temperatures.

4. Samples scoured at higher temperatures showed greater adsorptive powers for hydrochloric acid from solution. These factors were taken to indicate increased damage to wool scoured at higher temperatures.

5. Samples scoured at 120 degrees F. appeared best with regard to openness, while samples scoured at 140 degrees F. appeared best with regard to color.

6. Basing conclusions upon an overall consideration of these tests, and taking note of openness, color, residual impurities, loss of wool by solution, and damage, it appears that the optimum temperature for satisfactorily scouring

wool for purposes of laboratory shrinkage determination is 125° F.

V. REFERENCE

(1) Steinhardt, J.; Fugitt, C. H.; and Harris, M. J. Research Nat'l. Bur. Standards 25, 519 (1940) Research Paper No. 1343.

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TRADE NOTES • NEW PRODUCTS

OBITUARY

MARTIN L. GRIFFIN

MARTIN L. GRIFFIN, retired consulting chemist, died on Friday, August 28th, at his home in Taunton, Mass. He had been in failing health for some time. He was 84 years old.

Mr. Griffin was born in Northampton, Mass. and graduated from Amherst College in 1883 with a B.A. degree. He received his M.A. from the same college three years later. He then opened a laboratory in Holyoke to serve the paper field. He later entered the employ of such paper companies as the West Virginia Pulp and Paper Co., the Oxford Paper Co., and the Champion Fiber Co. He was contemporary with the entire history of the development of the wood pulp industry in paper making and a frequent contributor to trade publications. He was also closely allied with the textile finishing field. He acted as consultant on finishing problems from time to time and in 1919 entered the employ of the Mount Hope Finishing Co. as chief chemist and remained until he retired from active work in 1928.

He was a member of the American Chemical Society, the Society of Chemical Industry, the Technical Association of the Pulp and Paper Industry, the American Association of Textile Chemists and Colorists and the American Mining and Metallurgical Engineers. He was also a member of the Segregansett Country Club, the former Winthrop Club in Taunton and the Chemists' Club and Amherst Club in New York.

He is survived by his wife, two sons, a sister and five grandchildren.

ARTHUR H. THOMAS

ARTHUR H. THOMAS, president of the company which bears his name, dealers in laboratory apparatus and chemicals, died on August 31st at his home in Haverford, Pa. He had been ill for three months and was 69 years old.

Mr. Thomas was born in Beaver County, Pa., attended the Westtown Boarding School, and in 1892 entered the employ of the Philadelphia firm of James W. Queen, manufacturers of optical and scientific instruments. He founded his own company in 1900.

He was a trustee and director of Bryn Mawr College and member of the board of managers of Haverford College. He was also a member of the board of the Prudential Mutual Life Insurance Company.

He is survived by his wife and two daughters.

• IN CHEMICAL WARFARE SERVICE

Raymond J. Carey, Jr., is on leave of absence from General Dyestuff Corp. and is now on duty as a first lieutenant in the chemical warfare reserves at Edgewood Arsenal. Mr. Carey is a graduate of Tufts College.

• RUBBER-COVERED ROLLS

Specifications for the manufacture of rubber-covered rolls used in the paper, textile, tanning, steel, and other industries were issued by the Director General for Operations on August 15th in order to save an estimated 25,000 pounds of rubber per month.

The specifications (Amendment 15 to Order M-15-b-1) require the use of less rubber in compounds for rubber-covered rolls. Washing machine, printer, fingerprint, and business machine rolls are not covered by the amendment.

• AWARD TO HOOKER

Hooker Electrochemical Company's Niagara Falls plant has been selected to receive the new joint Army-Navy Production Award in recognition of outstanding performance in the production of war materials. This award is the first given to a chemical manufacturer in the New York Chemical Procurement District. Appropriate ceremonies at the plant marked the presentation made at Niagara Falls on September 8. Prominent Army, Navy, State and Civic officials as well as prominent chemists, engineers and educators were present.

• MOLDED PLASTIC BUTTONS

New economies in the manufacture of clothing issued to our Armed Forces are expected from the wider use of molded plastic buttons, following the acceptance by the Army Quartermaster Corps of a new melamine plastic for buttons on all garments required to meet the most severe service conditions, according to the American Cyanamid Company.

Melamine plastic is produced by the American Cyanamid Company from calcium cyanamide, one of its basic products. It is said to possess extraordinary resistance to destructive agencies as demonstrated by gruelling tests made by the Quartermaster Corps before its acceptance as a button material. Heretofore, natural materials such as bone, vegetable ivory and pearl, and certain plastics were used for specific applications. The new Melmac material is said to be the first to be approved for all purposes on the basis of service tests for laundering, sewing, strength, stability of color and sterilization.

Economic advantages of using plastic buttons are said to include (1) lower costs by avoiding machining operations required to make buttons of other materials; (2) materials required are domestically available in ample quantity; (3) hand labor is eliminated; and (4) the buttons are completely uniform.

It is stated that buttons of Melmac, the original melamine molding material, may now be used to replace those made of natural products costing two to four times as much.

More than twenty-five molders of plastics in the United States are equipped to manufacture plastic buttons of melamine materials.

Melamine, essential constituent of the new plastic, is also used in a variety of synthetic resins made by the American Cyanamid Company. These serve important purposes in the plywood industry, in paints and enamels, and in finishes for textiles and paper.

• JOINS AMERICAN VISCOSE

Howard S. Shearer, for the past fourteen years a research associate with the Technical Department of the National Association of Hosiery Manufacturers at the National Bureau of Standards, Washington, D. C., has joined the Sales Development

Department of the American Viscose Corporation located at Marcus Hook, Pa., it is announced today. Mr. Shearer is a graduate of George Washington University and of National University, both at Washington, D. C., and holds degrees in general engineering and law. In his new work he will specialize on the development of industrial projects in which products manufactured by the American Viscose Corporation are used.

• GLOWING FABRIC

A coated fabric has been developed by the du Pont Company which glows with visible light in complete darkness. It may be cut into letters or strips to mark doorways, staircases, hand-rails, fire extinguishers, arm bands, instrument dials, control panels and the like.

The fabric is said to be much cheaper than luminous paint, and can be applied simply to any type of surface with casein glue, wallpaper paste or thumb tacks. It is stated that no special primer is required as with some luminescent finishes. Moreover, the fabric may be removed with ease.

Exposure to electric light or sunlight for only thirty seconds is sufficient to give the coating the power to glow for a minimum of four to six hours. The bluish light emitted by this new material under total blackout conditions may be renewed an endless number of times by re-exposing to light.

A protective topcoat has also been evolved to provide additional durability for outdoor use. Luminescent coated fabric is available to industrial fabricators in a sheeting fabric base in 60-yard rolls of 40-inch width. It is the product of the "Fabrikoid" Division of the du Pont Company.

• AWARD TO LEEDS & NORTHRUP

William L. Batt, Deputy Chairman of the War Production Board and President of SKF Industries, Inc. of Philadelphia, made the address of welcome at the presentation of the Army-Navy Production Award (the Army-Navy "E") to the Leeds & Northrup Company on Saturday, September 5, at noon. The ceremonies were attended by company employees and their friends and were held in Wister Park, corner of Lindley and Belfield Avenues, near the Leeds & Northrup Company's plant.

Admiral Henry A. Wiley, U. S. Navy retired, was the Navy's official spokesman and presented the "E" burgee. It was received by C. S. Redding, President of the Leeds & Northrup Company, and J. L. Johnson, President of the L & N Employee's Association. Lieutenant Colonel Thomas H. Stilwell, Commanding Officer, Eastern Pennsylvania District, Internal Security Force, U. S. Army, was the Army's official representative at the ceremonies.

Following the presentation of the burgee, Lieutenant Commander L. F. Freiburghouse, U. S. Navy, Bureau of Ordnance, presented "E" pins to L & N Company employees.

The Leeds & Northrup plant is producing classified material for the fighting forces, in addition to a greatly augmented production of measuring instruments, telemeters, automatic controls and heat-treating furnaces. Production and other facilities of the plant were inspected by Admiral Wiley and his party after the presentation ceremonies.

• LIEUTENANT IN NAVY

Richard W. Wilson, General Dyestuff Corp., has been commissioned as a lieutenant, senior grade, in the U. S. Naval Reserves and is on duty at Quonsett Point, Rhode Island. Mr. Wilson is a graduate of the Massachusetts Institute of Technology.

• ASA SPECIFICATIONS

The American Standards Association recently announced approval as American Standards of the following two specifications dealing with textile testing machines and methods of testing wool felt. These standards were developed by the American Society for Testing Materials and are of considerable interest to manufacturers and purchasers in the textile industry, as well as to consumer groups:

Textile Testing Machines (ASA: L15.1-1942; ASTM: D76-41). This specification describes testing machines generally applicable for the determination of certain physical characteristics of textile materials. It outlines types of machines to be used for determining breaking strength and elongation of textiles, thickness gage, etc.

Testing Wool Felt (ASA: L16.1-1942; ASTM: D461-40). The methods of testing wool felt described in these standards are applicable to fabrics which are neither woven nor knitted, but built up by the interlocking of wool fibers, by mechanical work, chemical action, moisture and heat. Felt may be produced by one or a combination of any of these factors; it may consist of wool or wool mixed with other fibers, or fibers other than wool. The standard takes up physical tests on length, width, thickness, weight, breaking strength, splitting resistance and also outlines a chemical and microscopic analysis for the product.

These standards are available from the American Standards Association, 29 West 39th Street, New York, at 25c per copy. They can be ordered singly or in sets.

• TIRE "SANDAL"

A "sandal" for automobile tires, that may help to keep many of America's cars on the road, is now beeing woven on carpet looms at the Thompsonville, Conn. plant of the Bigelow-Sanford Carpet Company.

Developed jointly by Bigelow and the United States Rubber Company after many experiments, the sandal is made of a heavily woven cotton fabric with an extra high pile. The sandal is treated with an asphalt emulsion to make it durable and waterproof.

It is expected that the sandal will add many miles to the life of tires, although speed of cars using them must be kept low. Motorists will be able to have the sandals attached to tires at garages and service stations. The sandals will be wrapped around tires, with "ears" tucked between tire and rim. Heavier than usual tire pressure will be required when the sandal is used. However, the fabric is said to be thick enough to cushion whatever "hard riding" might be expected from the extra pressure.

• JOINS BURKART-SCHIER

Byrd Miller of Greenville, South Carolina has joined the sales organization of Burkart-Schier Chemical Company, Chattanooga, Tennessee, manufacturers of wet processing agents for the textile industry. Mr. Miller has had many years experience in the textile industry and will make a valuable addition to this company.

Sales office will be located in the Woodside Building, Greenville, South Carolina. Burkhart-Schier now maintain sales offices in Chattanooga, Birmingham, Chicago, Nashville, Knoxville, Charlotte and Greenville. Plants are located in Chattanooga, Nashville, and Knoxville.

• MEETING, A.A.T.T.

The next meeting of the American Association of Textile Technologists will be held on Wednesday evening, September 16th, at the Building Trades Employers' Association, 2 Park Avenue, New York City. Dinner will be served at 6:00 P.M. Walter Krauss, chief microscopist, technical laboratories, Sears, Roebuck & Co., Chicago, Ill., will speak on "Microscopy of Textile Fibers and their Identification."

• JOINS ARMED FORCES

Samuel I. Parker, general sales manager of Ciba Co., has been commissioned a major and has reported for duty at Fort Benning, Ga.

Mr. Parker was an officer in World War I and served overseas. He is on leave from Ciba.

Take an Inventory Now

Industry Advised to Obtain Replacements As Nation's Military Manpower Needs Increase

By MAJOR GENERAL LEWIS B. HERSHEY, U. S. A.

Director of Selective Service

MANPOWER is a most important strategic material of today. Every employer should make a prompt inventory, appraisal and analysis of the manpower in his own plant as he would inventory his stock pile. In order to keep production going and at the same time furnish men for the armed forces, industry should now establish an orderly replacement program.

In order to secure temporary deferments for essential men while he is training women, young men, older men, men physically handicapped or those with a high degree of dependency, the employer should know the fundamental principles in the operation of his local Selective Service Board. Certain steps should now be taken by each employer. He should know how many men on his pay roll are between the ages of 20 and 45. He should investigate the classification of every one of those men. On the basis of such an inventory he should prepare to plan ahead and train men for replacement of those who must necessarily enter the armed forces if we are to have the sort of army which can win the war.

Deferments Temporary

Deferments, granted so that employers may train women or men not liable to early induction, are temporary deferments; they cannot exceed six months and in many cases may be for only thirty, sixty or ninety days. The Army today has to train a bomber pilot within a period of eight months to operate a very technical machine with an instrument board which puzzles an expert. Why, therefore, should industry insist that it assume that it can take two or three years to train men for industrial tasks not nearly so complicated?

The fundamental purpose of every deferment of a registrant is to allow an employer to train a replacement. Only in a few rare instances can an employer expect to have these temporary deferments continued for more than the six months period. These are only in cases where an abnormally long period of training is required for a replacement and the eight months needed in which a bomber pilot can be turned out now, is something to remember in this connection.

Employer's Responsibility

Employers may seek the deferment of their necessary men with or without their consent.

Here is how they go about it.

On page 3 of the Selective Service Questionnaire (Form 40) which is sent to each registrant before he is classified is the following:

INSTRUCTIONS.—*If your employer believes that you are a necessary man in a necessary occupation, it is his duty to fill out form 42A requesting your deferment. You may also attach to this page any further statement by yourself which you think the local board should consider in determining your classification. Such statement will then become a part of the questionnaire.*

This is on all the questionnaires distributed during the past six months. The fact that the Selective Service System now specifically mentions the filing of Form 42A as the manufacturers' duty is a clear indication of the Selective Service System view on the responsibility of each employer in this matter.

The employer can secure Form 42A at the local board and the local board will consider the employer's request when the form is properly filled out and signed.

If such request should be denied because the man, after consideration of the claims offered for him, is not considered to be indispensable to the company's operation, and is needed more in the armed services, the local board will advise the employer of its refusal of such an occupational deferment.

The local board does this by sending to the employer, at the same time it notifies the registrant of his classification, a Form 59.

May Make Appeal

There are ten days after Form 59 is mailed by the local board to the employer during which the employer can appeal the registrant's case.

The registrant will not be ordered to report for induction during this ten-day period.

In order to take an appeal the employer simply has to sign his name to Form 59 which he has received, and return it to the local board; or in case the Form 59 is not received from the local board, any written request will have full value to make such an appeal effective.

When Form 59 is returned by the employer the appeal procedure becomes automatic.

All necessary forms are available at the local board in the employer's immediate vicinity or at the office of the State Director of Selective Service.

If the local board and the appeal board deny the appeal for the occupational deferment of a key man, the employer may then bring the matter to the attention of the State Director at the State Selective Service Headquarters, with the request that the case be reopened or appealed by him to the President.

Definite Duty

A double duty rests upon the employer. He should personally know what his manpower situation is. He should not leave the job to a minor employee to decide who is necessary. The employer who delegates the task of filing a request for deferment to a clerk, the executive who does not make a complete inventory of his whole plant today, is negligent. Likewise, the employer who files requests for deferment of men who can be replaced by women, or others, is keeping reinforcements out of an Army which is battling for us all. The employer engaged in essential war production who has been required to greatly expand his plant and who then fails to request deferment for his key men is also negligent.

A good rule to follow: Don't ask deferments for any men who can be replaced by training another individual not likely to be eligible soon for service in the armed forces.

Make an inventory, request deferment for any man whose immediate going into the armed services would retard production of vital war material or other services essential to the war effort, or who is needed to maintain national health, safety and interest.

Only when an employee is working in a critical occupation within an essential industry should a Form 42A be filed for his temporary occupational deferment.

Make Replacements

Yes, an inventory within a man's own plant is called for; also an appraisal and analysis of the manpower in the community. There is many a man over 45, or a man physically handicapped, or a woman who can do that job that the 23-year-old boy is doing who took a 12-weeks course at a learn-quick school.

There are not more than sixty million people in this country who are capable of effective productive effort. These men and women represent our total manpower available to win the war. They must do everything that must be done in a total war; maintain transportation, communications and utility systems, maintain public services, grow food for ourselves and

our allies, mine the metals and produce the raw materials, fabricate and produce the amount of consumers goods necessary to maintain even a restricted national life and the supplies, weapons and munitions of war; also most of all they must provide the men who land on strange shores in far places, the men who carry the fight to the enemy on a multitude of far-flung frontiers. The rest of the population who mine raw materials and produce the weapons with which these men fight must be a self-disciplined team working in unity. The individual personal convenience, comfort or pleasure, or the convenience and ordinary leisurely replacement program of the employer, will have to be given progressively less consideration as the war gets tougher and the casualty lists grow.

When we hear of the big armies we are going to raise, we must all remember that it takes at least five men or women to produce what they eat, use, fight with, and wear. With less than sixty million availables in this country, those figures are worth deep consideration.

• SUPERVISION OF RATINGS

About three hundred men have been trained and are being sent to WPB regional offices and Army and Navy field procurement offices to supervise issuance of priority ratings on war contracts in the field, it was announced on September 5th by J. A. Krug, Deputy Director General for Priorities Control.

To permit the armed services to send directives covering the new procedure to all of their field officers, the date on which PD-3A certificates would not be valid without the countersignature of a WPB official was postponed from September 7 to September 10.

• PHOTOELECTRIC REFLECTION METER

The Photovolt Corporation has recently placed on the market a photoelectric reflection meter for measurement of reflectance and color. There are two models, 600 and 610, and they are designed for measuring the reflectance and color of solid surfaces, fabrics, pastes, powders and opaque liquids. They are provided with a "search unit" which is placed on the surface to be measured so that the test specimen need not be inserted into the instrument. This is said to offer the advantage that samples can be measured in rapid succession, that the sample may be of any size, and that the operator can easily select that part of the surface on which he wishes to take readings.

The search unit is connected to the instrument proper by a flexible cable, and comprises the light source and the photocell. Model 600 is operated from two dry-cell batteries which are housed in the instrument casing. Model 610 operates on 105-130 volt, 50-60 cycle AC current.

Model 600 is recommended by the manufacturers when general reflectance is to be measured and when the instrument is to be taken to places where current is not readily available. Model 610 has the advantage that it is usable with more selective color filters, that it has higher sensitivity and that it registers dispersed reflection without responding to specular gloss.

Three color filters, red, green and blue, are furnished with the instruments. It is stated that, by using one of these filters, properly selected for the particular test, it is usually possible to improve the spread of the readings so that differences which are hardly perceptible to the human eye are reliably registered. By using two or three filters on each sample, data are said to be obtained which characterize the color of the surface under test.

The operation of the instrument is said to be simple and convenient and to require no training on the part of the user. The search unit is first placed on the standard in terms of which the readings are to be taken and the needle set on 100. Then, when the search unit is placed on the sample, the needle indicates directly the reflectance of the sample in per cent of the standard.

For measurement of infrared reflectance the search unit of Model 610 is provided with a suitable gelatin filter mounted in front of the measuring photocell. Zero suppressor controls and compensating photocell are left out on Model 610-A which, otherwise, is equal to Model 610.

The instruments are self-contained and built into a portable housing with cover and carrying strap. It is claimed that they are rugged and shock-proof so that no special care is necessary in operating, carrying or shipping. The search unit is stored in a compartment of the housing when the instrument is not in use.

A bulletin describing the instruments is available from the Photovolt Corporation, 95 Madison Avenue, New York City.

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• NEW INDUSTRIAL TRUCKS

Lewis-Shepard Company, 504 Walnut St., Watertown, Mass., announces that it has placed in production, after a long period of experiment, design and research resulting in important improvements, a line of medium capacity (3,000 lb.) industrial lift trucks. These trucks are of the tilting fork type, telescopic and non-telescopic.

These Lewis-Shepard industrial trucks are offered in both gas and electric powered models. They are said to be rugged, compact and low-slung,—with a one-piece, ribbed-and-reinforced, single casting main frame which keeps the center of gravity low and thus adds to maneuverability and stability.

Recently added to its well-known line of products, these industrial power trucks are claimed to give Lewis-Shepard one of the widest line of materials handling products on the market.

Circulars describing these trucks are available upon request.

• AQUALIZED PAPER FABRIC

The Brown Company, producers of purified cellulose, 500 Fifth Avenue, New York City, has recently developed a new product known as Aqualized paper. It is suggested that this product may be suitable as a substitute for cloth and burlap. It is claimed that the product has unusual strength when wet, a feature which is not found in ordinary papers which tend to lose strength and disintegrate in contact with water.

It is claimed that, by means of an exclusive process, the individual cellulose fibers in the paper are effectively interlocked and fastened, giving an inherent wet strength all the way through the sheet that is independent of any coating or sizing on the surface of the paper. Some types of the product are highly absorbent and others are made to repel water. Samples of the product are available upon request.

Bleaching Operations—

(Continued from page 448)

Monel laundry machines are not affected by the "chlorine" bleaching treatments commonly carried out therein.

Although, as noted previously, Monel ordinarily is not used nor recommended for continuous contact with hypochlorite bleaching solutions, it has been so used under certain conditions. For instance, in one mill, a Hussong type bleaching machine in which the tank is made of concrete has a false bottom of wood with Monel fastenings. This equipment is used for bleaching cotton with a calcium hypochlorite solution containing from 2.5 to 3 gpl. "available chlorine." The Monel fastenings are in excellent condition after several years' use and have been removed from old false bottoms and re-installed in new ones on several occasions during this period. Monel fastenings are used also in the yarn racks which are subjected to the more favorable conditions of periodic contact with souring and rinsing as well as the bleaching solutions.

It seems probable that under certain conditions Monel acquires a chemically protective coating in "chlorine" bleaching solutions. Nevertheless, experience does indicate that, as a general rule, caution should be observed in the use of Monel outside the recommended limits of "available chlorine" concentration and time of contact. Fortunately, these limitations enable its use under the conditions most commonly encountered in practice, in which protection of the fiber from deterioration limits "available chlorine" concentrations and bleaching periods to ranges that are safe for Monel.

BLEACHING WITH PEROXIDE

Corrosion by Peroxide Solutions

So far as metals and alloys are concerned, the principal difference between peroxide and hypochlorite bleaching solutions lies in the relatively non-corrosive nature of the peroxide solutions. In addition, peroxide solutions are susceptible to decomposition at rates which may be influenced by catalytic effects associated with the materials used for the construction of bleaching equipment. When considering possible effects of metals and published data on individual metals, it must be remembered that all alloys containing iron do not act like iron, and all alloys containing copper do not act like copper. So far as nickel, Monel and Inconel are concerned, their effects on the rates of decomposition of peroxide bleaching solutions are insignificant as compared with the decomposition-accelerating effects of atmospheric dust, light, and substances introduced with the material being processed.

Rates of corrosion for nickel, Monel and Inconel in peroxide bleaching solutions have been found to be negligible in both laboratory and plant tests.

Decomposition of Peroxide Solutions

It is possible to estimate the effects of metals and alloys on peroxide bleaching solutions by exposing specimens in contact therewith and determining the extent of decomposition of the solutions after a given period of time as compared with a sample of solution containing no metal. However, since contact with metal is only one of several factors influencing the decomposition of a peroxide solution, it is obviously difficult to isolate the effect of the metal itself and to get consistent results from test to test. On several occasions, tests of this nature have been made in the Research Laboratory of The International Nickel Company, Inc., and in independent laboratories.

In a preliminary test, samples of commercial 100-volume hydrogen peroxide retained their original strength after 24 hours in closed containers, either in glass or in contact with nickel.

In another test, bleaching solutions containing about 10 gpl. of hydrogen peroxide and 10 cc. per liter of sodium silicate (at pH 10-11) were made up and held in nickel, Monel and glass vessels covered with watch glasses. The ratio of exposed metal area to solution volume was 380 sq. cm. (59 sq. in.) per liter of solution. This may be com-

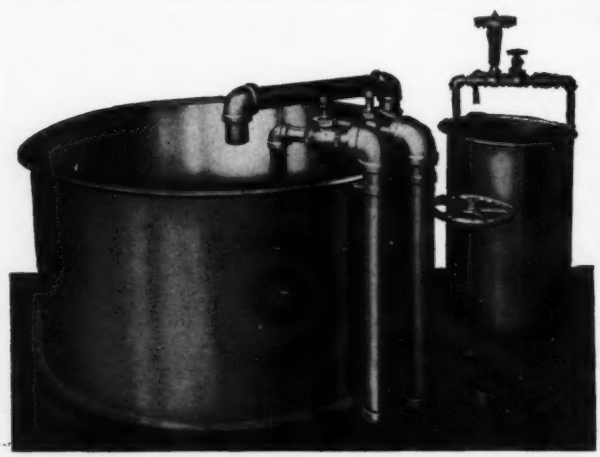

Fig. 3—Nickel-clad steel peroxide bleaching kier in use at a cotton finishing mill.

Fig. 4—A battery of Monel-lined vats used for peroxide bleaching, stripping and dyeing with all types of colors. The reels, baffle plates, heating units and tie-rods are also of Monel.

Fig. 5—A close-up of one of the Monel-lined vats shown in Fig. 4. These have been in use for approximately 10 years.

pared with a ratio of 190 sq. cm. per liter in a typical 200-lb. hosiery dyeing machine, or 32 sq, cm. per liter in a 400-lb. piece goods machine. The solutions were kept at about 185° F. for 80 minutes, then allowed to cool to atmospheric temperature, and held for 17 hours. Care was taken to keep the samples away from direct sunlight and to exclude dust. The concentrations of hydrogen peroxide were determined by titration after 40 and 80 minutes, and after 17 hours, with the results given in Table V, corrections being made for about 5 per cent loss of volume by evaporation. Both nickel and Monel had practically negligible catalytic effect upon the rate of decomposition of the peroxide.

TABLE V

Rates of Decomposition of Peroxide Bleaching Solutions, Containing 10 cc. per liter of Sodium Silicate (at pH 10-11), in Nickel, Monel and Glass Containers

Time	Temp. ° F.	Container					
		Glass		Nickel		Monel	
		Peroxide Conc'n gpl.	Loss in Peroxide per cent	Peroxide Conc'n gpl.	Loss in Peroxide per cent	Peroxide Conc'n gpl.	Loss in Peroxide per cent
0 min.	185	10.16	0	10.25	0	10.21	0
40 min.	185	9.35	8	9.12	11	8.87	13
80 min.	185	8.53	16	8.20	20	7.85	23
17 hr.	80	7.62	25	7.28	29	7.05	31

How sensitive peroxide bleaching solutions may be to the effects of foreign matter from the atmosphere is shown by the results of another group of tests. In the experiments described previously, the samples were kept in a room where the air was comparatively pure. Other tests were made in a chemical laboratory where the atmosphere was contaminated. In the latter tests, samples of peroxide solution lost 81 per cent of their strength in 1 hour at 190° F. in a glass vessel, and only 61 per cent in a nickel vessel at the same temperature. At another time and under the same apparent conditions, the loss in glass was only 32 per cent, and in nickel only 12 per cent. It is evident, therefore, that impurities in the atmosphere can have considerably more effect than the metals under discussion, and that laboratory tests where adequate control is not exercised may be quite unreliable in estimating the suitability of a material for peroxide bleaching equipment.

It is known that if certain metal salts are added to a peroxide solution its rate of decomposition will be increased. Nickel and Inconel are not active in promoting decomposition of peroxide solutions, and the relative inactivity of Monel is probably due to its high-nickel content and negligible corrosion rate.

TABLE VI

Decomposition Tests in Hydrogen Peroxide
Temperature: 30° C.
Agitation: At 32 ft. per min.

	100 Volume Hydrogen Peroxide				25 Volume Hydrogen Peroxide			
	Time days	Peroxide Concentration per cent		Loss in Peroxide per cent	Time days	Peroxide Concentration per cent		Loss in Peroxide per cent
		Initial	Final			Initial	Final	
Nickel	4	30.4	30.2	0.7	5.6	7.48	7.01	6.3
Monel	8.2	30.7	25.4	17.3	5	7.24	6.45	10.9
Inconel	4	30.2	29.9	1.0	5	7.16	6.82	4.8

The results of laboratory tests designed to measure the catalytic behaviors of nickel, Monel and Inconel in promoting decomposition of 100 and 25 volume hydrogen peroxide solutions are given in Table VI. The data show that Monel has some slight catalytic effect on the rate of decomposition of the 100 volume solution and, in this respect, is inferior to nickel and Inconel. Monel is not a satisfactory material for use in shipping drums to transport 100 volume hydrogen peroxide, but is useful for contact with hydrogen peroxide solutions in the concentrations used for textile bleaching purposes. Nickel and Inconel may be used with safety for handling both the 100 and 25 volume hydrogen peroxide solutions in storage and in transportation.

Sodium Peroxide Solutions

No special care is required in the use of Monel equipment in contact with peroxide bleaching solutions prepared either by the action of acid on sodium peroxide or by dilution of high-strength hydrogen peroxide. However, certain precautions are desirable in the preparation of bleaching solutions by the first method.

The common practice in using sodium peroxide consists in adding it to a bath containing the required amount of sulfuric acid, then adding ammonia or sodium silicate

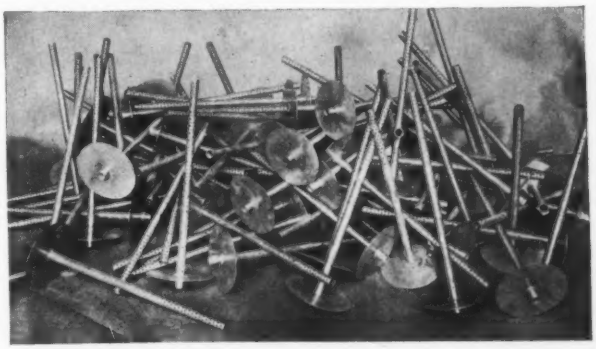

Fig. 6—Perforated nickel spindles used in the peroxide bleaching of textiles. Monel spindles are also used for the same purpose.

to adjust the alkalinity to the proper value. When this process is carried out in a Monel kettle or machine, a small quantity of metal is taken into solution by the strongly oxidizing acid solution resulting from the addition of sodium peroxide to the acid bath. While the amount of metal dissolved is not large enough to shorten the life of the equipment appreciably, the bath suffers some loss of bleaching power, and on the addition of alkali the dissolved metal is precipitated in the form of insoluble compounds which might discolor the goods. These difficulties may be avoided in either of two ways:

1. Since Monel is free from attack by peroxide solutions so long as these are neutral or alkaline, the bleach bath may be made up by first dissolving the sodium peroxide in water in the Monel equipment, and then adding the required quantity of acid to the point of neutrality, after which ammonia or sodium silicate is added to attain the desired alkalinity. With this method, an oxidizing acid solution will not be formed and, therefore, no corrosion of the metal or decomposition of the solution will occur.
2. The sodium peroxide and acid can be mixed in the usual way in a crock or wooden tub outside the Monel machine or kettle, and then added to an alkaline solution in the Monel equipment.

Usually, the latter method is preferred since the solution of sodium peroxide in water is rather slow. However, it has been found that satisfactory bleaching can be accomplished in Monel equipment by either method.

Practical Experiences with Peroxide Bleaching

Nickel in the form of nickel-clad steel is an economical material for peroxide bleaching kiers, while Monel is used generally for the common types of dyeing equipment in which bleaching operations are carried out. Tests with Inconel have shown it to have no more effect than nickel or glass and, consequently, it too is suitable for all types of peroxide bleaching equipment.

In view of the uncertainty of laboratory tests, as noted previously, the best guide to the usefulness of a metal or alloy is provided by its behavior in practical application. Some examples of the uses for Monel and nickel-clad steel in peroxide bleaching equipment are given in the following paragraphs.

In one plant processing cotton, cotton-rayon mixtures and rayon, all the bleaching and dyeing equipment is of Monel. The bleaching procedure involves a preliminary scour for 15 minutes at 175° F., using a mixture of pine oil, soap and sodium silicate. The bleaching bath, which follows scouring, is made up to contain 20 lb. of sodium silicate and 3½ quarts of 100 volume hydrogen peroxide per 300 gallons of solution; in this bath 150 lb. of goods are bleached in from 1 to 2 hours at a temperature of 180° F. The Monel equipment has given complete satisfaction over more than 10 years of continuous service.

Monel hosiery dyeing machines are used regularly for the bleaching of silk, cotton, rayon and wool with peroxide. Monel perforated tubes and spindles are used generally for the kier bleaching of cotton threads in packages.

In a large cotton mill, a nickel-clad steel kier is used for the peroxide bleaching of cotton thread in packages. The yarn is given a preparatory boil in a solution containing castor oil and soda ash at 200° F., the peroxide bleach itself is made up with 100 volume hydrogen peroxide and sodium silicate, and bleaching is carried out at 180° F. The bleached yarn packages are given a preliminary drying in a Monel centrifugal extractor. A recent report states that the nickel-clad steel is satisfactory in every respect for the peroxide bleaching process.

The foregoing examples by no means exhaust the records of successful use of Monel and nickel-clad steel for peroxide bleaching installations. They show that, under conditions commonly used in bleaching operations, Monel, nickel and nickel-clad steel provide satisfactorily useful life, and are cited simply to demonstrate that service records are an invaluable complement to laboratory tests of the suitability of materials for chemical processing.

•CLASSIFIED• ADVERTISEMENTS

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $6.25 per column inch or less per insertion.

POSITION WANTED: Textile Colorist. Capable of making and matching of shades for hosiery industry. Past employment—sixteen years as foreman dyer for second largest hosiery mill in south. Willing to prove my ability as dyer for thirty days at my expense. Experienced in dyeing and finishing of pure silk, rayon, cotton, nylon and mixed fibers. Draft status 3-A. Write Box No. 398, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Dyestuff salesman for the state of New Jersey and surrounding area. Submit qualifications and experience. Write Box No. 401, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

COLORIST WANTED: Second hand, experienced rayon, acetate linings, New York. Must be textile graduate. State fully education, experience, age, family, references and salary desired. Write Box No. 402, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Experienced chemist for laboratory in conjunction with superintending production of dyeing and finishing cotton piece goods. Should be capable of testing all types of dyes and chemicals. Central location. Well established dye and finishing plant. In reply give Draft Status, full particulars, training and experience and salary required. Write Box No. 403, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

Why it pays to keep in touch with your Calco Representative

Quite frankly, supplies of dyes and related chemicals are "subject to change without notice" these days. Changing demands for government requirements—re-alignments in priorities and allocations—variations in demand for civilian use affect the availability of scores of colors almost from week to week. Some can be furnished only on priority, but many, many others can be furnished in ample volume. Even among these, there is unavoidable uncertainty as colors which may be scarce today may be plentiful tomorrow—and vice versa.

A practical solution to this difficulty is to keep in touch with your Calco representative as you plan your production. He has a constant, up-to-date check on what colors are available—which require priorities—and the likelihood of replenishing supplies which are currently short. So keep in touch with your Calco representative by phone—or better still, ask him to call—you'll find him a worth-while member of your "ways and means" committee.

There's no time to lose
There's just time to WIN
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... HAVE MET THEIR MATCH!
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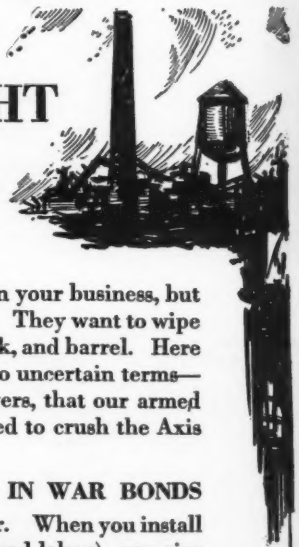

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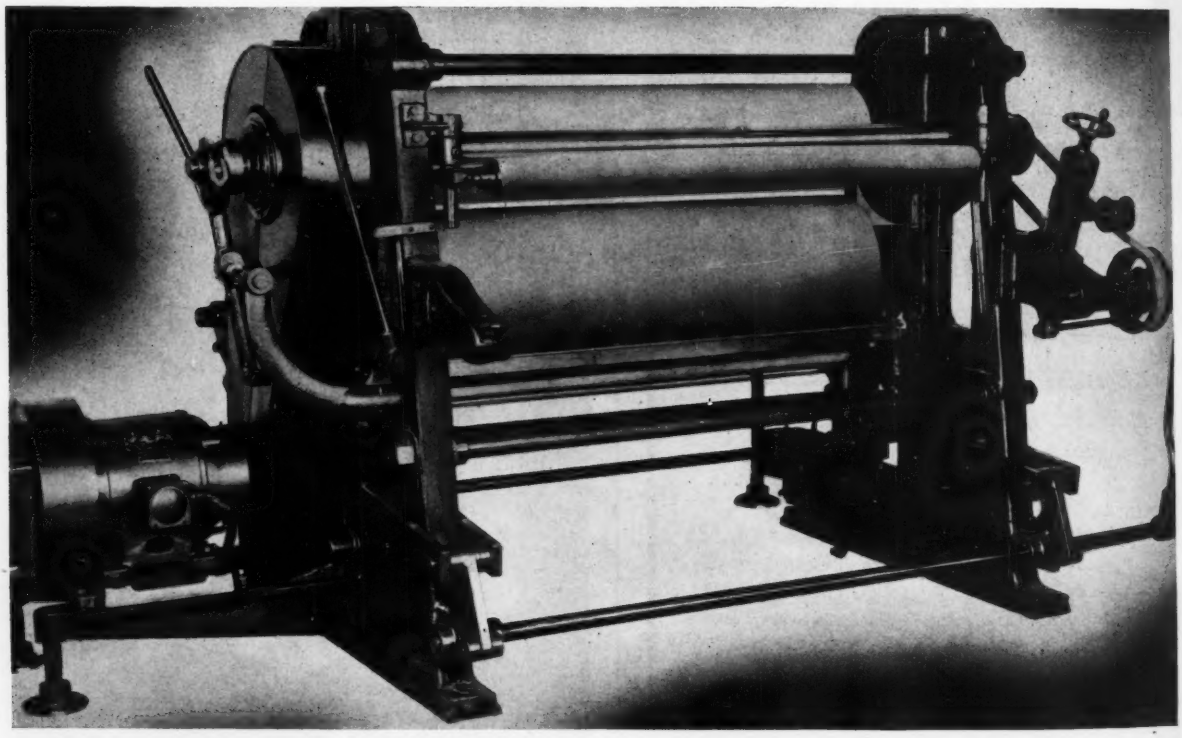

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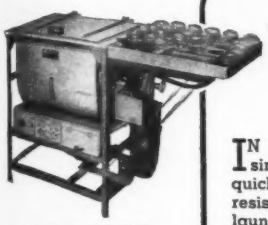

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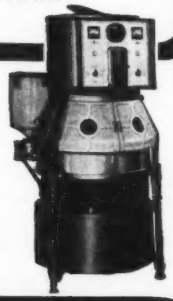

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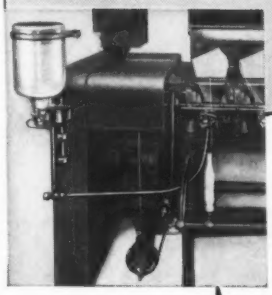

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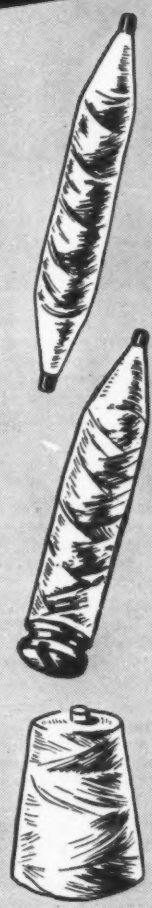

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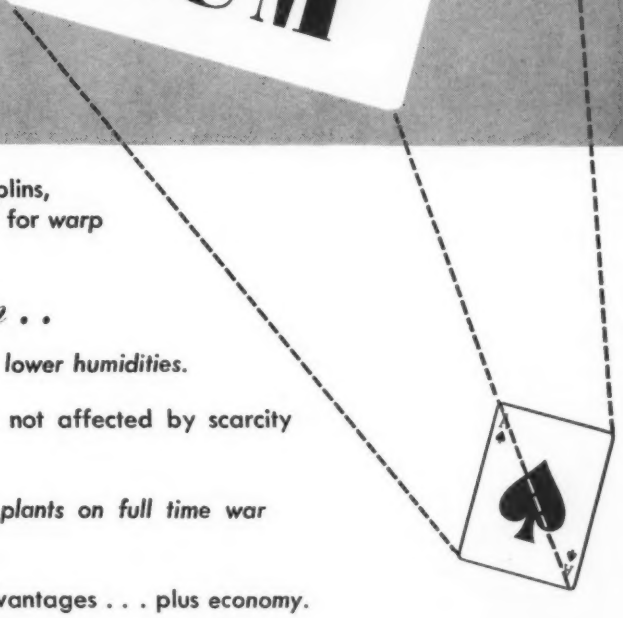

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You, and every mill in the Textile Industry, face the urgent need for producing thousands of yards of cloth for camouflage. It's an extra job—in addition to your full-time responsibility of clothing and equipping America's fighting men.

Mill engineers and superintendents are meeting the challenge of production by keeping their mechanical equipment at top-notch efficiency.

In the Wet Finishing Department of leading textile mills, Butterworth Machines are working day and night. The cooperation of Butterworth Engineers is freely offered to every mill seeking to achieve increased productive efficiency . . . or to repair or replace worn-out or obsolete equipment.

While Ordnance production has first call on our facilities, we are still building Textile Finishing Machines as required in America's great war program.

***64%**

of equipment now in use in the wet end of textile finishing cannot operate at a profit in competition with modern machines.

*Proved by Research

H. W. BUTTERWORTH & SONS CO.
Phila., Pa. Serving the Textile Industry since 1820
Offices in Providence, R. I. and Charlotte, N.C.
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PRODUCING GUN MOUNTS FOR THE UNITED STATES ARMY

FOR ANY FIBRE...
OR COMBINATION OF FIBRES...
FOR ANY WARTIME FABRICS
...IN EVERY GARMENT
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...Scholler Products play an important part, because they help the mills get the very utmost out of every Fibre, regardless of its nature... Alluring, Lasting Beauty, Wearability, Spot and Snag Resistance, etc. Scholler Products have been recognized as a standard of Quality ever since we started in business, over 35 years ago. Constant improvement in facilities and research, plus familiarity with the Consumers' requirements, have always kept us abreast of the times.

Ask a *Scholler Specialist* to call—there's no obligation.

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SCHOLLER BROS., INC., Mfrs. of Textile Soaps, Softeners, Oils, Finishes • Collins and Westmoreland Sts., Philadelphia, Pa. • St. Catharines, Ontario, Canada

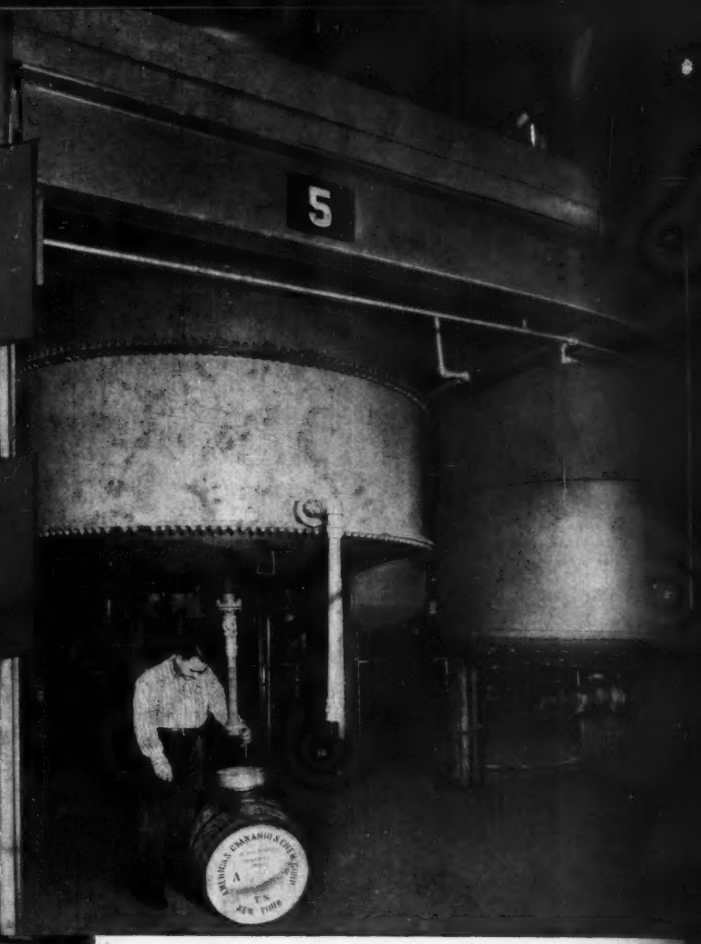
The practical advantages of

LARGE-SCALE PRODUCTION

to users of

CYANAMID QUALITY CHEMICALS

in the textile industry



(above) One of Cyanamid's modern large-capacity units for the production of textile chemicals. Large-scale production means greatest possible uniformity in chemical supply.

(left) A similar unit in another Cyanamid plant. Each step in Cyanamid's volume production methods is planned and carried out to deliver highest quality as well.

REGARDLESS of whether the volume required is moderate or in carload lots, chemicals for the textile manufacturing processes should be of a consistently reliable, uniform quality at all times.

The source of supply of textile chemicals... the sulphonated oils, penetrants, sizing compounds, wetting agents and other specialties . . . therefore becomes a primary consideration to the manufacturer in establishing economically dependable processing results.

Cyanamid recognizes this vital part played by chemicals throughout the textile industry. Cyanamid is also aware that the supplies required by the textile industry can best be provided by high-standard volume production, insuring the barrel by barrel uniformity made possible by large batch manufacture. As a result, Cyanamid has set up modern large-scale facilities adjacent to the important centers of textile manufacture.

Cyanamid today is able to assure textile manufacturers that their requirements, both large and small, will be accurately and quickly filled with chemicals of a consistently high quality.

Cyanamid is also prepared to serve textile manufacturers on problems relating to the proper selection of chemicals to meet changing specifications in production... a valuable extra service without charge or obligation that is backed by extensive research and practical field experience.

SULPHONATED OILS; PENETRANTS; SOFTENERS; FINISHES; SIZING COMPOUNDS; DECERESOL® WETTING AGENTS

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